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OR

YEARBOOK

1956

O. R. YEARBOOK

from

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Foreword

It is with great pleasure that we of HOSPITAL TOPICS present the seventh volume of the O.R. Yearbook. Like the previous Yearbooks, this volume brings together in a permanent reference form, the important material published in the O.R. Section during the past year. In addition, this Yearbook for the first time includes material from other sections of the magazine of interest to the operating room staff.

Editorial matter presented in the O.R. Section is selected and prepared by the HOSPITAL TOPICS' staff. The guidance of Carl W. Walter, M.D., of the surgical staff of Peter Bent Brigham Hospital, Boston, and of Dorothy W. Errera, R.N., is gratefully acknowledged.

Gordon W. Marshall

Publisher

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Nursing Opportunities in Plastic and Reconstructive Surgery

By Richard C. Webster, M.D., Richard J. Coffey, M.D., Virginia Rainville, R.N., Muriel Dow, R.N., and James A. Russell, APSA

Part I—Planning

In 1945, we began taking reconstructive surgical services where they were needed in eastern Massachusetts.

In planning a service organization, it is helpful to select a goal. This was our first step. The goal was, and is, to provide the finest reconstructive surgical services for all who need them at the lowest possible cost to the patient.

We had to know what the needs were. A knowledge of plastic and reconstructive surgery already told us what kinds of patient abnormalities we could eliminate or help. But how many patients had these kinds of abnormalities? Where were the patients with these problems? Were any people who needed these services not getting them? Would all patients who required plastic surgery come to one or two centers in a big city?

In analyzing the needs, we came to these conclusions:

1. Plenty of patients needing the services we could provide were not getting them.
2. Many were in community hospitals.
3. An appreciable number would not or could not come to city centers.

One further question had to be answered. Could plastic surgical patients get as good care in the community hospitals as in the centers? We carefully observed patients with comparable problems in both kinds of hospitals. In general, the care was equally good in both types of hospitals for most plastic surgical patients. For some, the smaller community hospitals had the advantage; for certain others, the bigger centers were better.

As soon as we knew that fine services could be provided in almost any hospital for plastic surgical patients, we knew that we had to build an organization to take the services where they were needed. Because long

*From The Webster Clinic for Plastic and Reconstructive Surgery, Brookline, Mass.

distances compound overhead expense problems greatly, we tentatively selected eastern Massachusetts as our service area. It still is today.

We firmly believe that the key figure in medicine is the family physician. Whenever one of our plastic surgical patients has a family physician who goes to the hospital in which we have the patient, we try to have his family physician carry out any parts of the over-all care he is capable of providing. Teamwork cuts down the total costs greatly to the patient.

What the family, local, or referring physician cannot or does not want to do, we must do. It is here that our nurses have made one of their greatest contributions. With enough special training in the needs of the plastic surgical patients, they have been able to share with the plastic surgeons almost all of the pre- and post-operative dressings and treatment maneuvers required in our field. Were it not for our nurses, we would have to turn many patients away and charge much more for the same services.

We have spent much time in thinking about delegation. We believe that the months of special training which our nurses have, qualify them to do many things which a few years ago only the doctors did. They do not operate, of course; but in most of the other aspects of patient care they do the job as well as the surgeons.

Part II—The Role of the Nurse in the Distribution of Medical Care

There are six major reasons for doing plastic surgery. We have selected patients illustrating each reason. These will show how the principles of delegation work when applied to the nurses in the distribution of reconstructive surgical care.

1. To SAVE LIFE

The patient shown in Figure I, a carpenter, fell 12 feet, fractured his spine, and cut the spinal cord. He was dying of infection and from loss of proteins and other vital substances from multiple decubitus ulcers of his sacral and trochanteric regions and of the calves, heels, and ankles. Before attempting surgical closure of the ulcers, we had to get him to eat and to want to live.

Figure I (1). Above: Left side before surgery. Huge sacral and large trochanteric ulcers.

Figure I (2). Ulcers closed by moving flap downward and by skin-grafting. Flap donor site covered with split-thickness skin grafts. Donor sites for these show near shoulders. Patient now ready for rehabilitation.

Nurses' part:

Preop: Many visits to hospital (over 40 miles away) to do dressings and to help build up morale and nutrition.

Operation: Second assistant.

Postop: Numerous visits. Suture removal, recipient and donor site dressings, drain removal.

2. To STOP PAIN

The young man shown in Figure II had extensive third degree burns. His agony was minimized by construction and use of weight-bearing plaster body shells and early skin grafting. Excellent teamwork got this patient home 41 days after the first photograph was taken. Two massive skin-grafting procedures were done. Forty-three to 45 percent of body surface showed third degree burns.

Nurses' part:

Preop: Dressings, debridements, cooperation with dietitian in nutritional regimen, instruction to hospital nurses in care of major granulating wound.

Operations: Scrub nurse.

Postop: Dressings to recipient and donor sites, rapid

Figure II. Photograph on first visit to patient after constructing weight-bearing shell. Padded contours fitted to patient distribute pressure away from bony prominences, prevent bed sores.

mobilization routine, nutrition.

3. To REPAIR RAVAGES OF MACHINE AGE

The trousers of the boy shown in Figure III were caught in the drive shaft of a lumber truck. The drawing shows the extent of his wound. The lower end of the femur was torn out of the knee joint, and the skin and fat of the leg were twisted and ripped off as demonstrated. The conviction that amputation was the last thing to do, not the first, saved this youngster's leg. The knee joint was reconstructed and the leg covered with split and full-thickness skin grafts. Timmy now enjoys full activity. The fact is, he fractured his arm one year later playing basketball!

Figure II (2). Going home 41 days later. He is shown holding anterior and posterior burn casts. Anterior and posterior skin-grafting procedures were used. Wounds are completely healed.

Nurses' part:

Preop: Dressings, debridements, morale-building, nutrition, construction of plaster shell, preparation of granulations for grafting.

Operation: Second assistant.

Postop: Dressings to donor and recipient sites, suture removal, morale-building, nutrition.

4. To REMOVE LESIONS AND REPLACE THE MISSING PARTS

In cancer surgery, our usual goal has three parts:

(1) Curing the patient

(2) Restoring function

(3) Restoring appearance.

They are listed in their order of importance.

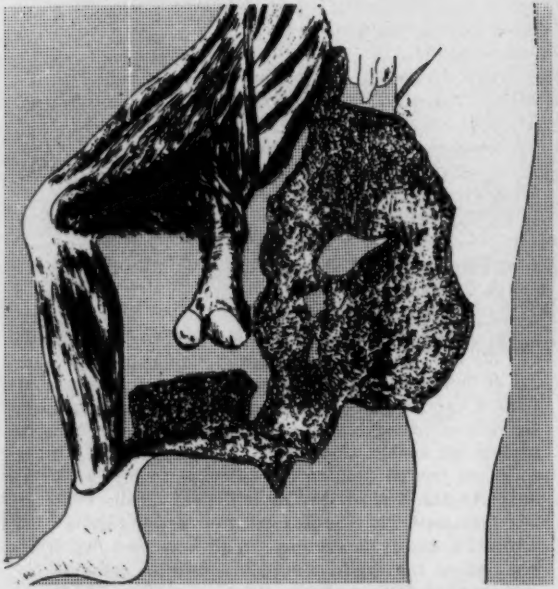
The patient shown in Figure IV was a young man with a cancer of the upper eyelid. To be as sure as possible of curing him, we had to remove normal tissue around his cancer along with the tumor itself. Therefore, the medial half of the outer parts of the eyelid down to the eyelash border and part of his eyebrow were removed. The plastic repair was accomplished with a rotation flap from his nose, an advancement flap from the rest of the eyelid, a z-plasty, and an eyebrow reconstruction. He now has normal appearance and function and has had no recurrence of his tumor in over five years.

Nurses' part:

Preop: Nothing.

Operation: First assistant.

Postop: Removal of dressings and sutures at office.



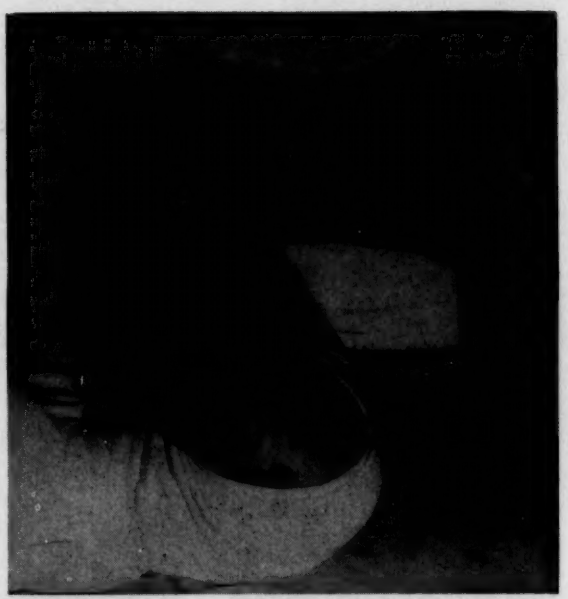
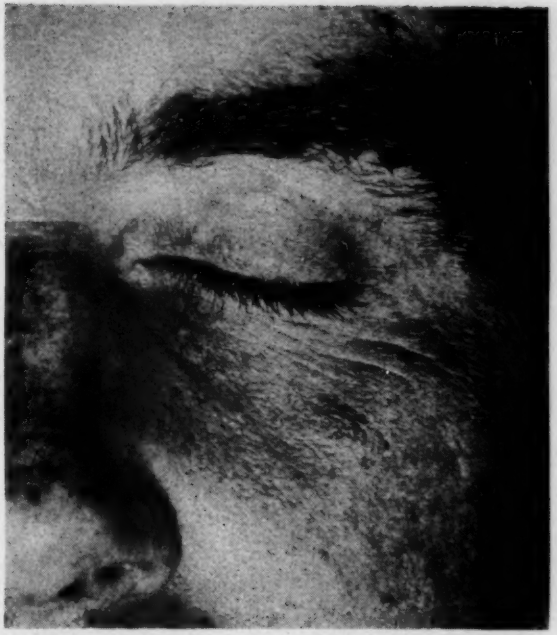


Figure III. Severe compound dislocation. Lower leg hangs by shreds of muscle, tendon, ligaments and, fortunately, enough blood vessels and nerves. Skin and fat of entire leg are narrowly attached only at angle and groin. After reconstruction of knee has been successfully accomplished, leg must be skin grafted. Anterior part is grafted first; thicker grafts are used around and on knee to minimize shrinking and withstand expected wear and tear. At right: Full flexion and extension are possible. There are no long vertical, straight-line scars to contract and limit motion. Full-thickness skin grafts applied in the knee area "took" 100 percent, despite being left in open air with pressure dressings.

Figure IV. Cancer of upper eyelid. This lesion was excised with a one cm. margin to effect cure.

The patient in Figure V was an older man with a grade two squamous cell carcinoma of the lower lip. It extended to within 11 mm. of the commissure on the right side and even less than that on the left. His entire lower lip was excised, and a new lip was made from his cheeks in the same operation.

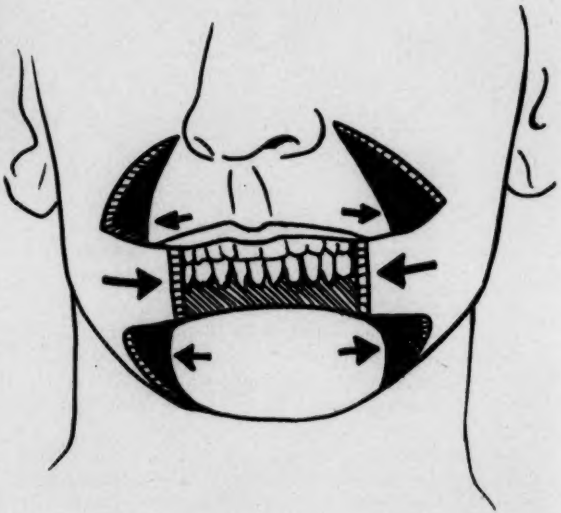
He has no evidence of recurrence over five years later and can eat, drink, control his saliva, and speak normally. He can even suck through a straw and whistle. The red border of his new lip was made from inside lining of the cheeks.



Above: Cured after wide excision and plastic reconstruction. Can you find any scars? Actually, they are partly hidden in normal folds.

Figure V. Ulcerated crusted carcinoma of lower lip. Entire lower lip was removed to cure patient.

Below: In total excision of lower lip shown at left, two cheek flaps of skin, fat, muscle and mucous membrane were used in repairing it. Arrows indicated direction of advancement for closure of defect. Note how most lines of closure (later scar lines) will fall in natural folds of face.



Nurses' part:

Preop: Nothing.

Operation: Second assistant.

Postop: Dressings and suture removal in hospital and at office. Instruction of patient in lip-stretching exercises.

5. To CORRECT NATURE'S MISTAKES

More people are born with birthmarks, missing or deformed parts, and other congenital abnormalities than most of us think. One in every 750 children born has a cleft palate or "harelip" or both. The little girl in Figure

Above: New lower lip of adequate size.

VI, a nurse's daughter, had a "double" cleft lip and palate. She had a so-called "wolf snout" deformity. The tissues that should have made up parts of her nose, the middle of her upper lip, and part of her gum were rammed far out and forward.

Plastic surgery had to be done to allow her to suck, chew, swallow, breathe, and eventually speak normally —also to improve her appearance and to diminish her susceptibility to colds and deafness. Two weeks after birth, she was operated upon.

Nurses' part:

Preop: Feeding instructions to nursery personnel.

Operation: First and second assistants (two nurses).

Postop: Lip care, suture removal, follow-up visits for nutritional and general condition, later speech recording at Webster Clinic.

6. To INCREASE THE PATIENT'S WORTH TO HIMSELF AND OTHERS (by relieving him of feelings of embarrassment and inferiority)

The psychology of deformity may be a complex study, but it is easy enough for anyone to understand the acute embarrassment and the withdrawn personality of the person who is constantly stared at or laughed at. In a famous study on deformity as a factor in crime,* it was found that plastic surgery helped all but 2.6 percent deformed criminals "go straight"—compared with the 20 percent to 78 percent average recommitment rates. No one really can evaluate the amount of emotional agony of the person who thinks himself different from others in an unpleasant or laughable way.

The first example was a little boy with bilateral protruding ears, a cruel deformity because it is thought "funny" by everyone but the child and his parents. "Dumbo," "Jughead," "Dog-Ears," and "Loving Cup" are but a few of the brands these unfortunates carry from the beginning of school days onward. Prevention of irreparable psychological scars was the goal of plastic surgery.

Nurses' part:

Preop: Local preparation.

Operation: First assistant; application of molded splinting and pressure dressing.

*Pick, J. F., Surgery of Repair, Principles, Problems, Procedures, Vol. I, pp. 430-31. Philadelphia: J. B. Lippincott Co., 1949.

Postop: Dressing at office.

A large nose can be measured in inches, but the indication for correction lies within the mind of the patient. A young woman (Figure VII) is painfully aware of the appearance of her nose. If she is hindered socially or is restricted in job opportunities, she needs help.

Nurses' part:

Preop: Local preparation.

Operation: First assistant, application of splint.

Postop: Removal of packs and splint.

Obviously, the nurses have been quite active in the care of these patients. The surgeon must judge what methods should be used for each individual patient and do the operations. With proper training the nurse can do most of the dressings and can make most of the hospital visits. We feel that the nurse is the ideal answer to many of the economic problems of patient care.

Part III—Nurses' Role in Teaching and Research

Because we wish to get the finest results for patients and to continue to improve the quality of our services,

Figure VI. Infant with double cleft lip and palate. Picture shows roof of nose through wide clefts in palate. Note how far forward the tab of tissue, which should be middle of the upper lip, is displaced. Above, right: After first operation. Clefts in lip closed. Note beginnings of the Cupid's Bow.

Figure VII. Left: A cosmetic problem with clear emotional, social, and economic complications. At right: A new nose—a new life. This girl can face others with new confidence.

we must teach constantly. The surgeon must continually impart information to and encourage new skills in those who work with him.

This information and skill cannot be allowed to stagnate. It has to reach those directly concerned with the care of the patient (See Figure VIII).

It is essential that this skill be taught because the patient must be prepared for surgery in the morning by having just such dressings done every four hours, starting the night before surgery. With this method, pale, watery, dirty, edematous granulations can be transformed into pink, firm, clean, flat areas producing a fertile field for the "take" of skin grafts. Under these practical, realistic conditions we find that our nurses teach effectively and that the ward nurse proves an apt student.

In the operating rooms, nurses are expected to inform others about the special technical details of plastic surgery—the dozens of little things that make the big differences in a plastic procedure. For example, the plastic surgeon, and the patient's tissues, can tell the difference between a new blade soaked three minutes and a blade soaked several days. Soaking too long dulls the edge he so often needs to get the finest results. Since the three-minute soak is not routine in any hospital, our nurses have to teach personnel this and other special needs.

Proper handling of small, delicate instruments, fine sutures, special splinting devices, and certain dressing materials, instrument set-ups, draping and lighting requirements—these and many other details must constantly be taught to hospital and visiting members of

Figure VIII. Students and graduates are shown how to prepare this burned leg for skin-grafting the next day.

the profession.

Over 150 hours of formal lectures are given each year by Webster Clinic personnel. Our nurses help in this educational program in two main ways, by lecturing and by helping prepare the presentations. Over 10 hours of work go into the preparation of a one-hour lecture. Extensive use is made of audiovisual teaching aids, and time and skill are required for their preparation. All Webster Clinic personnel are engaged in this work "behind the scenes." We have found that our nurses can put many points over to other nurses, in formal lectures, better than our surgeons can.

Movies, exhibits, and papers are three other teaching

activities which engage the attention of our entire organization. Every one of these activities not only benefits our patients and nurses but also raises the level of care for other patients and of education of other nurses.

Almost everyone agrees that research is good and that it should be done, but all too many think George should do it. We feel that it is the crux of better care for the future, and we recognize that to teach well and intelligently we must first carry on research into the experience of others and into our own experience. Therefore, essentially everything we do is recorded. The data thus accumulated are indexed on IBM cards and analyzed in the research process, and the nurses are engaged in every step along the way.

Above: Webster Clinic nurse teaches the proper set-up for a nasal plastic operation.

Later, when information is needed, it can be found in a few minutes instead of the hours or days that might be required without this system. One very important advantage is that anyone in the office can find the information for the doctors without any briefing or supervision.

Many nurses have wondered why our nurses learn about and help with photography. Color photographs of our patients are in many respects the most important parts of the plastic surgical record. Words cannot *show* what a patient looked like before correction of his deformity.

Over 50,000 feet of 16 mm. color movies and over 15,000 35 mm. color slides have been taken of our patients. Our nurses have assisted in making these pictorial records, and also have been involved in the teaching and research done from the movies and slides. They are constantly engaged in research in the nursing phases of reconstructive surgery. Numerous improvements in nursing care routines and in dressing technics can be attributed to them.

Simplification of our instrument kits is a good example. We cover a large area and operate in over 55 hospitals. We must do surgery in many parts of the body. At one time we carried a large number of special instruments. Since every extra instrument hinders kit portability, increases chances of loss, and adds to instrument handling time, our nurses carried out a critical and exhaustive instrument investigation, using work simplification methods. They found that 634 instru-

ments could be reduced to less than 100 which would allow us to do all procedures in this field. The weight and bulk reduction saves professional tempers, and the time reduction saves patients' money.

Part IV—Predictions

We believe that the achievement of a worthwhile goal in medicine requires teamwork. The nurses in our clinic are an integral part of our professional life. They allow the doctors to accept many more patients for care than they could take on without competent professional help. We believe that the trend of increasing delegation is a healthy one and that it is the only way in which high standards of medical care in this country can be provided to all those who need care, at the lowest possible cost.

In view of this realistic need, nurses can only move upward, learning greater and greater skills and participating more and more closely with the doctor in many phases of patient care. As the skills and responsibilities of the nurses soar higher and higher, the nurses in turn will have to delegate responsibilities and authority to nurse's aids, operating room technicians, and other helpers of many kinds. These people in turn must be trained to fill the gap by taking over the more mechanical duties of nursing care.

We disagree with the archaic concept that only the surgeon can touch the dressings, that only the surgeon can tell which stitches should come out. In plastic surgery today, there are far too few qualified men to care for all those who have the need for plastic surgery. We have to have help, and our nurses give it to us.

This has not been an easy concept to put across in conservative old New England. Patients have seen the common sense in it and have accepted it readily in almost all cases; but many nurses, doctors, and hospital administrators have had to be shown. The sincerity, capability, and diligence of our nurses have accomplished wonders in showing the doubters what can be done by a service group working together.

What of the future?

In 10 years there will be over a 15 percent increase in population. There will be almost a 30 percent increase in the number of old people and almost a 40 percent increase in the number of school-age children. Forty percent more cars will be clogging the highways.

In 10 years the American worker will have a 37-hour work week, and 150 more leisure hours per year than he has now. There will be almost a 30 percent increase in disposable income—the money left over after taxes. There will be a 50 percent increase in the number of people going to college.

With more people, more money, more leisure time, and more education all added to the enormous growth of prepayment health insurance plans, the people will be needing and seeking earlier and ever more medical or health services.

The demand, the market is there already; it will be even greater in the future. How do we supply it? Doctors and nurses are not increasing in numbers fast enough to keep up with the demand. To become a qualified plastic surgeon at least 15 years' training beyond high school is required. Today there are only about 215 qualified plastic surgeons practicing in this entire coun-

try. Just a few can be trained at a time. Our group cannot see any glut of nurses on the market ahead.

The supply is short today and will be shorter tomorrow. Our professional responsibilities are and will be enormous. Our challenge is to find new ways of training, more and better ways of delegating, and more intelligent and progressive methods of upgrading skills, responsibilities, and the authority to go with the responsibilities. The American public cannot afford the luxury of having highly and expensively trained people doing things that less skilled personnel can do under supervision.

Think what the increase in industrial development means to nurses. Promotion of safety programs, emergency first aid, continuous plant coverage, day-by-day maintenance of health services, in many places are already here. Will doctors be able to provide all the diagnostic, preventive, and therapeutic services the labor unions and management want for the workers of tomorrow? Of course not. Nurses will have to help, and they will have to be paid commensurately with their skills and responsibilities.

The ever-rising trend toward suburban living means more time and longer distances involved in physicians' house calls. We see a dramatic future increase in the number of nurses making house calls to carry out home care under the direction of physicians. Anyone who has had to make bedside decisions in the home knows the heavy weight of responsibility which lies on the shoulders of the person who has to make the decision. The need will be for super nurses—not humdrum, irresponsible ones.

There can be only one road ahead for nurses. It goes upward—into services formerly thought of as purely doctor-provided. When surgeons do what they alone can do, and, by planning, allow nurses to do what they are capable of doing, everyone benefits—the patients, the nurses, the physicians, and the public.

Surgical Technical Aides in Action*

By Frances Ginsberg, R.N.**

● Experience has proved that carefully selected and adequately trained nonprofessional personnel can fulfill a vital role as effective adjuncts to professional nurses.

When the work load is great, staffing is a problem, and if nurses, doctors. and administrators can be helped to see the value of this new group of workers, the program will be both functional and practical. Certainly there are problems to be worked out, but they are not insurmountable if the motivation for success is present.

I became interested in surgical technical aides during my military service, which proved that selected lay people can serve a most meaningful role. Later, when my work was concentrated in Maine and western Massachusetts, I found that staffing operating rooms with competent nurses was an acute problem in many hospitals. Although I felt incapable of creating nurses, I did feel it might be possible to develop programs for selected lay people to assist the overworked nurses.

For an experimental training program we selected the Cooley Dickinson Hospital, Northampton, Mass. After evaluation we felt that this experimental, five-week program was successful. Since then, five such programs have been given throughout the country.

Through specialized workshops, more and more nurses are participating to learn how to train the trainee most effectively. We have found less opposition to the utilization of these valuable people as more information and adequate interpretation have been given. In hospitals now employing surgical technical aides, everyone agrees they are here to stay.

By definition, a surgical technical aide is "a selected lay person, who through a well-planned and organized course of instruction is prepared to function intelligently under the direct and continuous supervision of qualified professional nurses in areas concerned with the maintenance of asepsis."

Hospitals may call these lay workers anything they please. Some have called them "attendants," others, "surgical technicians," and still others, just "technicians." For the sake of our published booklet *(Surgical*

*Discussion presented at the third annual conference, Association of Operating Room Nurses, Boston, January 30-February 1, 1956.

**Miss Ginsberg is a consultant in operating room nursing, Bingham Associates, Boston, and author of *Surgical Technical Aide Instructor's Manual*, published by the American Hospital Association, 1954.

Technical Aide Instructor's Manual) we used the term "surgical technical aide," because when on a national basis we were trying to devise a name for this group of workers, there was a great deal of discussion from laboratory technicians and x-ray technicians, whose program admittedly is much more extensive than what we provide for the surgical technical aides.

After trying out terms with groups throughout the country, we decided that these persons are primarily aides, given technical training in surgical asepsis.

For training these aides, a regional program which utilizes a central school for the instruction and experience has great merit, since more people can be trained in a relatively short period. However, we also acknowledge the work of on-the-job training, providing there is a qualified person to coordinate the theory and practice.

The following articles describe the surgical technical aide program from three viewpoints: that of the operating room supervisor, the aide, and the assistant nurse instructor. Miss Vachula is the supervisor at Cooley Dickinson Hospital, Northampton, Mass., in which the pilot program was given, and Mrs. Shepard was a member of the first group of aides trainees. Mrs. Alden was an assistant nurse instructor in the 1955 program at the Thayer Hospital, Waterville, Me.

Both the positive and negative aspects of the program are presented. No program is successful unless everyone concerned is willing to make it so. Therefore, perhaps the key to success lies in selling the idea before the program starts.

The Operating Room Supervisor

By Katherine Vachula, R.N.***

● I am an operating room supervisor now working with eight surgical technical aides and six graduate nurses.

Other hospitals may be facing the problems that confronted us in 1952. We were extremely short-staffed. The work load was heavy, and overtime was the rule rather than the exception. Students were being exploited and being placed into experiences that made them more and more insecure. All in all we were in a terrible mess. Therefore, at the mention of Miss Ginsberg's program, we were eager to cooperate and felt that anything she had to offer was better than what we had.

After the initial conference, we prepared a plan for interpreting the philosophy and ideas of the program to each of the groups within our hospital.

To insure acceptance of this new worker, we felt it was essential to take the time to carefully interpret the concepts to all groups, whether or not they would be intimately involved with the program. Good will, we felt, was as essential as our teaching ability.

Discussions were held with the medical and nursing staffs, student nurses, other professional nurses, and ancillary staffs. During each discussion there were many questions from the group. Many challenges were

***Operating room supervisor, Cooley Dickinson Hospital, Northampton, Mass.

anticipated, since we recognized that any new idea is viewed with a great deal of skepticism and sometimes hostility.

These interpretations were a time-consuming task, and we thought we had included everyone in the hospital. But on the first day of our new venture we found that one of the staff surgeons had been on vacation during the planning of the program, and hence knew nothing about it. He challenged the program—became defensive, defiant, even belligerent. This surgeon so strongly opposed the utilization of the nonprofessional worker for operating room duties that he dogmatically insisted that none of the trainees participate in, or even observe, any of his surgical procedures.

Since the problem was vital, we discussed it with the hospital administrator. He advised us to plan our program around this surgeon. Special care was taken to avoid his contact with any of the trainees, or to involve him with the program in any way.

All the other surgeons on the staff were exceedingly cooperative and eager to assist in every way possible.

SURGEON DOES ABOUT-FACE

After the third week of the program, the picture suddenly changed. One afternoon our problem surgeon confronted us with a pained expression on his face. He asked why he was being left out of the training program!

Delighted with the question, we agreed that if he were willing to work with trainees, arrangements could be made.

As it happened, this surgeon was scheduled the following day to do a cholecystectomy. That afternoon in class we discussed the anatomy and physiology of the biliary tree and the operative procedure to be followed. Needless to say, we selected with great care the trainee we felt the most dexterous. Barbara Shepard was chosen.

She performed in a manner that reflected credit to herself and her teachers. She was able to answer intelligently the questions related to the anatomical structure of the parts exposed. Her poise and confidence made each of us feel "nine feet tall." This demonstration was what we needed to help this surgeon gain a new perspective on the utilization of the surgical technical aide.

Today, the surgeon who so strongly opposed even the very mention of nonprofessional workers in the operating room is now their staunch supporter. He not only whole-heartedly accepts the surgical technical aides, but requests their services on even his most difficult cases.

Although we were able to convince everyone in the hospital of the merits of such a program, not all individuals who participated achieved the same measure of success. Another student in Barbara's class, given the same quality and quantity of instruction and supervised practice, was unable to make the contribution of which the others were capable.

NEED FOR EFFECTIVE SCREENING

Since ours was a pilot study, the first such planned program in the United States, we realize that we made many mistakes. Perhaps the greatest was in our in-

ability to screen candidates effectively. We therefore believe that the success of such a program is dependent not only upon the adequacy of instruction but also upon the selection of good candidates.

How does this program affect our graduate nurse staff, and our student nurses' operating room experience? Our graduate nurses are intimately involved in the training program, and willingly assume responsibility for the supervision of the aides. This involvement has helped the graduates to recognize the tremendous value of the surgical technical aides in helping nurses to do a better job and thereby achieve greater job satisfaction.

Our student nurse operating room experience is not an ideal plan, but we feel that it is effective in helping us achieve our objectives. I believe most hospitals face the problem of how to give students the necessary operating room experience and practice in connection with their other curriculum requirements, which demand that they leave this department for hours at a time.

With the utilization of surgical technical aides in combination with our graduate staff, we have sufficient personnel to meet the service needs of our busy department. Therefore we have become extremely selective as to the types of experiences into which our students are projected. Our teaching has become more individualized, and we feel also that its quality has improved.

I understand that a controversy exists regarding the utilization of this new worker in conjunction with the student nurse program. We feel that each of us can learn much from the others, irrespective of job specification. Since we teach by example, and since the surgical technical aides perform their functions many times a day under supervision, we feel that they have much to share with any of us. Therefore, if we are unable to provide a graduate nurse to scrub with a student, we select one of our better technicians to work with her.

In our hospital, this plan has worked out extremely well, perhaps because in the orientation of new students the role of the aide has been carefully defined.

As a result of the 1952 experience, which has been repeated at our hospital three times since, our department is now running smoothly. The hospital administrator and the director of nursing service are whole-hearted supporters of the program, as are all the doctors and other hospital personnel.

The Aide Trainee

By Mrs. Barbara Shepard*

● When I learned that I was unable to enter nursing as a career, I still felt I would like to do some type of hospital work. I consulted the director of nurses at Cooley Dickinson Hospital, and she told me about a program in the formative stage in which selected nonprofessional workers would be utilized in the operating room. I was very much interested.

She felt that an assignment to the surgical unit would

*Surgical technical aide, Cooley Dickinson Hospital, Northampton, Mass.

enable me to observe the team in action. In addition, I would scrub instruments, fold linen, and perform various errands which graduate nurses had previously done.

After three months my interest had increased, and I couldn't wait for the training program to begin. When it started, in 1952, it was clear what was hoped to be accomplished and how this was intended to be done. We were given a five-week program of instruction which included discussions, demonstrations, formal teaching, supervised practice, and problem conferences. I soon found myself speaking the medical language.

The terminology used in conversations I had previously overheard in the operating room had frightened me somewhat, but the course was presented very well, and I did not find the material too difficult, nor the tempo too rapid.

After we had been oriented and had learned to circulate, we began to scrub at minor surgery such as D.&C.'s, vein ligations, and excision of cysts. I was a bit dubious at my first scrub, but the doctors and the graduate nurses were very helpful. As I began to acquire new skills and gain more confidence, I anxiously awaited the day when I would scrub for major surgery.

When this day arrived, I felt very proud to be a member of the team. I knew my assignment the previous night, and so reviewed the anatomy and physiology of the particular area. It pleased me a great deal to answer questions, to identify the anatomy when asked by the attending surgeon, and to understand what he was trying to accomplish.

Since then I have been given more responsibility, and have scrubbed many times for difficult, complicated, time-consuming procedures, but always under the supervision of graduate nurses. Working alongside the doctors, the graduate nurses, and the student nurses has added materially to feelings of warmth and friendliness. We get along very well.

WORK DONE BY AIDES

Surgical technical aides in our hospital assist in the care and maintenance of sterile and unsterile supplies for the operating room and central supply. We assist in cleaning and setting up equipment trays for surgical procedures, for anesthesia trays, and for dressing sets.

We check linen and fold and prepare it for the autoclave. We assist in housekeeping duties such as dampdusting daily or weekly cleaning. We assist the supervisor with her clerical work, and help with the transportation of patients to and from the operating room.

We perform all circulate and scrub duties, as well as all the above mentioned tasks, under the supervision of a graduate nurse. We also take "call" once or twice a week with a graduate nurse.

We do not give any medication by mouth, intravenously or subcutaneously. We understand the principles but are not permitted to administer it. We do, however, pour procaine HCl for local procedures, under the supervision of a graduate nurse and the attending surgeon.

What about the pay scale? I was paid the wage of a nurse's aide until the completion of the course. At that time I received an increase in salary, and have received additional increases at regularly scheduled intervals, until now I receive less than three-quarters of the professional nurse's salary.

For hospitals faced with the problem of an understaffed and overworked operating room staff, I believe the surgical technical aide program may be a solution. If the selected lay person has the interest and is willing to apply herself or himself to the learning experience, and if she is privileged to work with a fine group of operating room nurses, I am sure she will find the job satisfaction that has been mine.

The Nurse Trainee

By Mrs. Linda K. Alden, R.N.*

● Last year I served as a student instructor at the surgical technical aide training program given by Miss Ginsberg of the Thayer Hospital, Waterville, Me.

It was very unusual for me, after being a supervisor for 13 years, to be in a situation in which I had a wonderful experience, yet none of the real responsibilities.

I had several reasons for wanting this experience. The first one was very obvious. We were short of nurses in the operating room. We have the usual turnover because of marriages and pregnancies. Moreover, we anticipated a shortage in connection with the two-year nursing program being planned by the hospital—a pilot research study being conducted by Columbia University Teachers' College. We expected that the classes probably would be small until they got under way, and for that reason we probably would not have as many nurses available at the end of two years as we had at the end of the three-year course.

I was eager to explore Miss Ginsberg's ideas regarding personnel and operating room management. I hoped, too, for constructive criticism of my teaching. Never having had such criticism, I wondered how effective I was.

All these factors convinced the director of nurses and the hospital administrator of the value of the program, and I was given the time off, with pay.

The Thayer Hospital is a 63-bed unit with three operating rooms and two delivery rooms. Everyone is most interested in education, and the whole atmosphere is favorable to it. Boston University nursing students affiliate there for six weeks during the summer, and there are others who have opportunity for learning there. The medical audit has been accepted, and a nursing audit has been started.

My job was to audit all classes, prepare lesson plans, do practice teaching, assist in the supervision of the trainees during their practice, and help evaluate their progress. I was encouraged to offer constructive criticism toward improving the program.

I also had the pleasant opportunity for social hours with the trainees, at which I found that they had problems that they would like to discuss about the next day's classes. Giving this information to Miss Ginsberg helped make the program more meaningful.

*Mrs. Alden is operating room supervisor, Monmouth Memorial Hospital, Long Branch, N. J.

The class was composed of 12 trainees (nonprofessional persons) and three graduate nurses. The trainees included two men and 10 women. Their ages varied from 20 to 44. Ten were from Maine, one from Massachusetts, and one from New York. The two nurses besides me were from Maine. One had had no teaching experience, since she was an assistant operating room supervisor in a non-teaching hospital. The other was a clinical instructor, but had no operating room background, although she was interested in going into operating room work. I had had 13 years' experience.

The process, the course outline and content, were as described in the *Surgical Technical Aide Instructor's Manual,* published by the American Hospital Association. It's a very fine book, which has a place in any hospital. We use it as a guide, making changes as needed for implementation in our hospital.

One problem encountered during the course was that of correcting misinformation during practice teaching sessions. Miss Ginsberg handled this very well, but sometimes the trainees came to me, and I found the situation a little difficult.

Another problem was one which some teachers face—one trainee selected me as her ideal! Helping her to understand the problem and work it through was rather trying.

One trainee needed constant encouragement. He had carried a tremendous load at home and was working on two jobs at once to pay off large medical bills. Because of financial pressures, he finally had to leave the hospital employment.

Another trainee who was quite a distance from home became very homesick on week-ends. We made sure that she went out to Sunday dinner and was entertained as much as possible.

My experience was both pleasant and profitable. The opportunity to assume the leadership role for four days when Miss Ginsberg was away was quite stimulating.

What are the advantages of such a program? Teaching a large group of surgical technical aides at one time is an economy of time, money, and energy for all concerned. The program enjoys the support of many people who contribute to its success, and the stimulus that such a group creates for the teacher and fellow students is invaluable.

The program might have been further improved in a larger institution in which experiences might have been more diversified. However, since most of the trainees were returning to small institutions, this may not be a limitation.

Perhaps the greatest strength of the program came from the participation of the doctors and nurses of the Thayer Hospital, who gave generously of their time and intellect.

The Architectural Audit

By Sumner Price, M.D.*

The following portions from the article, "The Architectural Audit," are reprinted here because they are of interest to the operating room staff. The complete article appeared in the April, 1956 issue of HOSPITAL TOPICS.

● In any building program select the best architect available. However, give me one with imagination—one who will listen and ask questions, and request statistics you don't have—one who will, if neecssary, argue to draw you out and then proceed to show that it should be done some other way.

If necessary, get him a consulting architect to advise on materials, one who has constructed or supervised the plans of a large number of hospitals, and be sure to provide a consultant in electrical problems and one in air-conditioning, if air-conditioning is to be used.

The worst mistake which can be made is to chisel on reasonable architects' fees. If the architect is denied competent assistance, the apparent savings in fees are apt to result in false economy through use of improper materials, wrong lines of flow, or inadequate floor space to do the job well.

SURGERY

At the insistence of the doctors and anesthetists, several anesthesia induction rooms were added to the plans. We

*Dr. Price is administrator and medical director, The Queen's Hospital, Honolulu, Hawaii.

built 14 operating rooms; so there is no overcrowding, and the anesthestic inductions are done in the operating rooms. The induction rooms are used for storage of anesthesia equipment, and for the director's office, in spite of the fact that he had a specific area designed for him according to his own specifications. This problem is not too disheartening, however, because when the need arises these rooms can easily be converted into dental surgeries.

Doors of stainless steel were designed for the cupboards in the area assigned for storage of instruments. Shortly, these will come off, because they interfere with efficiency. Instruments subject to common use may best be stored in open cabinets, with pull-out shelves upon which the instrument pans may be placed during the preparation of the instrument pack.

The nurses developed storage space for hemostats by using a glove rack ordered by the surgical supervisor because she had forgotten to restudy the new lines of flow and procedure. When central supply took over all glove processing, the glove rack became obsolete. However, it does provide an excellent place for the hemostats, stored by the dozen, blades open.

Special heavy stainless steel trays, with 1½" sides, were made locally for instrument pack trays. The bottoms were perforated with half-inch holes to let the steam through in the sterilizing process. Daily, the instrument trays are prepared in advance, for elective surgical procedures, packaged, sterilized, and stored for the following day. The remainder of the surgical packs, including basins and linens, are done by central supply and transferred to surgery for storage.

Stretched metal shelves are used for storage for two reasons: (1) termites do not attack the metal and (2) the fenestra permit adequate circulation of air so as to avoid sweating or dampness. The shelves are emptied practically every day, but the packages are dated and labeled when they come out of the sterilizer, so that there is no accumulation of outdated materials. The doors on the cabinets, which the architect so beautifully designed, are due for the scrap heap because they interfere with the flow of work.

In the eye surgery rooms' doors we placed two panels of polaroid glass, which by simple rotation obliterate any outside light. We forgot to put these polaroid windows on the adjacent utility room door; so a sliding drop panel was devised which is just as good, and a lot cheaper.

When IBM clocks, or their equivalent, are installed in the hallways in surgery, be sure they are located where they are easily visible to the scrub area. Otherwise you may create a Grand Central station appearance, which may have little utility.

Mop sinks, if sunken in the floor, should not have too long a hose from the spigot. If the hose reaches into the bucket, there is a potential hazard of backflow which may contaminate the water supply.

Mop cupboards should have plenty of ventilation and should not be put in a certain area because it happened to be one left-over area in planning. Outside ventilation should be available for mop cupboards in order to avoid souring of the mops. A protective screen may be necessary to block the ugly appearance of the mops, but outdoor drying is essential.

Storage for oxygen and cyclopropane, or other gases, must be separate in surgery, or in any other place. Investigation of the National Fire Protection Association recommendations will be very helpful (NFPA pamphlet No. 56).

Money can be wasted in the purchase of expensive operating room tables at the request of the surgeons. The worst offenders are the orthopods and neurosurgeons who express desires for expensive apparatus and equipment and then push them aside after a trial period. Most of the time they work on a table which might just as well be a kitchen table. A Hawley table purchased not too many years ago is now in the basement in storage. An Albee-Comper orthopedic table purchased a year ago, at the surgeon's request, is now in storage, and in its place is a table at least 25 years old—which the surgeons requested for the orthopedic room.

Flooring in surgery may be plastic, terrazzo, or anything which is conductive. Selection of the proper flooring will depend on the locality, ground conditions, and a variety of factors. Waxes and accumulated detergents may obliterate the conductivity unless checked at regular periodic intervals. Terrazzo has many advantages, but may be difficult to keep in good shape in earthquake areas. It is not resilient, but in spite of its expense and other objectionable features it is one of the best floors for surgery.

Any floor containing magnesium chips, or any product which will depend on moisture content for conductivity, may increase the hazard in dry climates by giving a sense of false security. Chips have a tendency to work loose under the influence of certain detergents. Get expert advice on flooring, but don't depend on the word of salesmen. There is no perfect flooring.

Surgical Lounges:

Formerly the operating room nurses had a small rest room and locker room. Surgeons continuously entered this room to obtain sandwiches, coffee, or a snack. So in the new facilities we built a lounge for physicians, outside the dressing rooms, with a small kitchenette adjacent to it.

It was hoped that the area would effect a satisfactory improvement in "esprit de corps," with the nurses preparing the coffee and refreshments.

To our surprise, the surgeons protested and didn't want the nurses in the lounge area. Whether this was the result of shyness, oversensitivity, overcrowding, or just a break in the professional sound barrier has not been determined. As a result, we built a kitchenette, as an afterthought, in the new nurses' lounge, and the doctors go to the nurses' lounge just as they did in the old facilities.

Moral: Don't tamper with social customs!

Postoperative Recovery Ward:

At the suggestion of one of our mainland friends, we elevated the nurses' platform in order to provide a "high Tor" supervisory sweep of the unit. If we were doing the ward over, floor level would be used. The platform is just a stumbling block for busy nurses who do not have time to sit on the platform to observe. Nurses are at the patients' bedside, and so are the charts.

Two isolation rooms were made in the postoperative recovery ward at the insistence of the staff. To the best of my knowledge the only time we have used the cubicles

was on one occasion when a tired neurosurgeon was seen taking a nap between operations.

The wall-mounted suction, blood pressure apparatus for each bed, central oxygen supply, narrow beds with side rails attached, full-thickness mattresses, beds with removable head or foot, and beds with 8″ casters for ease of movement are all well liked.

GENERALIZATIONS

Flooring in other areas than surgery also presents problems. Preference for plastics must be guarded. They are more expensive than most types of flooring, but have the factor of "easy maintenance" to recommend them. Don't be fooled into thinking that any plastic will do. Recently we decided on a certain plastic flooring material for the laboratories. The same manufacturer made three of the samples tested, all under the name of vinyl plastic.

Tests of the samples were made with acids, alkalis, detergents, solvents, and dyes most commonly used in the laboratories. No perfect material was found which would resist all the agents used in testing, but one was found which resisted staining with dyes used in the laboratories, and this one will be used in bacteriology and hematology, because it was also resistant to spotting with alcohol and solvents.

The other samples by the same manufacturer were strongly spotted by dyes. Another sample was tested for the tissue room, in which solvents, and especially xylene, are apt to be spilled.

● *Members of the International Anesthesia Research Society met in Miami Beach, Fla., April 9-12, for the 30th annual Congress of Anesthetists. Abstracts of selected papers follow.*

Tracheotomy, Though Dangerous, May Be Life-Saving Measure

Endotracheal Tube May Avert Procedure Temporarily

Tracheotomy is a vital adjunct to the treatment of respiratory obstruction from secretions in any age group, from the newborn to the geriatric patient.

Even though logic indicates the necessity of tracheotomy, enough aversion to performing one exists to cause a temporizing which makes the procedure emergency rather than elective.

It is no wonder there is a tendency to avoid the procedure when so many patients who undergo tracheotomy die. Survival figures, however, show that many extremely ill patients with an otherwise poor prognosis are salvaged with tracheotomy. Respiratory failure is fatal, and dependence on antibiotics to clear an obstructed airway is foolish. In desperately ill patients, it may actually be more dangerous to delay than to perform tracheotomy. One endoscopic procedure to remove obstruction is acceptable, but repeated maneuvers are contraindicated.

An endotracheal tube may tide the patient over the critical period and avert tracheotomy temporarily. If, however, the tube irritates the larynx and pharynx and aspirations are not adequately done, it is far better to do an elective tracheotomy. Indications are any respiratory obstruction due to accumulated secretions, a loss of cough reflex, or an ineffective cough.

Complications of tracheotomy may be divided into operative and postoperative. Operatively, there is the danger of immediate severe hemorrhage, technical difficulty, massive aspiration of blood, and apnea. Postoperatively, the patient may develop atelectasis, bronchitis, or tracheitis.

Recovery may be complicated if a wrong tube has been inserted. The length of tube used is determined by the patient's anatomy, and a variety of tubes should be available at all times.—**Henry E. Kretchmer, M.D.**, Associate Professor of Anesthesiology, and **Hamilton S. Davis, M.D.**, Associate Professor of Anesthesiology, Western Reserve University School of Medicine, Cleveland.

(The following abstract is from a paper presented at the Tri-State Hospital Assembly in Chicago.)

Oxygen Only a Temporary Measure During Postoperative Cardiopulmonary Collapse

In treating postoperative cardiopulmonary collapse, the administration of oxygen may be hazardous, because while it may make the patient feel and look better, the underlying condition is still there and must be treated.

With rare exceptions, oxygen is a temporary measure.

Cardiac collapse results because of the failure of the heart to pump blood to the periphery or to take care of it on return. It is also caused by failure of the peripheral vessels in surgical shock and other hypotensive episodes, such as fainting, spinal anesthesia, introduction of ganglionic blocking drugs, or overdose of ordinary anesthetics.

Deficiencies in respiration occur because of a pneumothorax, fibrosis of the lung, lung abscess, pulmonary edema, emphysema, or obstruction of the airways. Other reasons for pulmonary collapse are muscle relaxants which depress respiration, severe pain, or constricting bandages.

In cardiac collapse during the postoperative period, an observing doctor may feel that when the pulse slows down and the blood pressure goes up after oxygen therapy the patient is all right. But the patient still must be treated for shock, and the doctor must recognize that something more definitive has to be done. If the cause is overdose of one drug, an antidote must be given in addition to the oxygen.

When a lung has collapsed, the patient is usually apprehensive, the pulse rate is very high, and the chest has a lag on one side. The patient will be relieved of apprehension by oxygen, and the doctor may be lulled into thinking he is cured, but the atelectasis must be treated.

In case of obstruction, the airways must be cleared and ventilation must be improved. Oxygen should be given but carbon dioxide must be removed at the same time. It is dangerous to give oxygen without making other provisions.—**Stuart Cullen, M.D.**, Professor of Surgery and Chairman, Division of Anesthesiology, University of Iowa, Iowa City.

Final attendance at the American College of Surgeons Clinical Congress, held in San Francisco, was 8,864. Abstract of a paper on anesthesia follows.

Electronic Respirator Demonstrates Superiority to Other Models

Suggests Possibility of Continuous Control of Respiration

A new electronic respirator has demonstrated a definite superiority over old respirators and opens up the possibility of continuous control of respiration by blood pH or oxygen saturation.

An electronic interval timer was connected to two solenoid valves. Air under pressure was then channeled through an air reduction valve, positive pressure reservoir, intake solenoid valve, and one-way valve to the endotracheal tube of a dog.

The expiratory arm of the Y-tube was connected, in series, to a one-way valve, outflow solenoid valve, negative pressure reservoir, and vacuum pump. The size of the reservoirs was then changed until physiological respiratory curves were attained.

Highly sensitive pressure differential switches were connected to tubes inserted on each side of the one-way valves and also to the interval timer. These were then adjusted so that, at reasonable pressures, the animal could trigger the pressure switch and gain assistance

for his respiratory effort.—**Charles E. Turbak, M.D., Robert B. Benjamin, M.D., Louis M. Levy, B.S.,** and **F. John Lewis, M.D.,** Department of Surgery, Ancker Hospital Surgical Research Laboratory, St. Paul, Minn., and University of Minnesota Medical School, Minneapolis.

● The Southeastern Hospital Conference of Nurse Anesthetists was held in Miami Beach in conjunction with the Southeastern Hospital Conference, April 18-20. Abstracts of two of the papers presented at the meeting follow.

Survey Shows 52% of Anesthetics Given by Trained Personnel

Need More Nurse Anesthetists To Supplement Anesthesiologists

A survey of anesthetists showed that 52% of all anesthetics are given in this country by people with formal training. Forty-eight percent are given by doctors and nurses who perform as part-time anesthetists without any formal training. In rare instances, anesthesia administration by orderlies has been reported.

Nurse anesthetists are definitely needed today to supplement anesthesiologists. There are more vacancies in teaching programs in this field than can be filled, and the nurses can most definitely survive as willing

Below: Margaret Singleton, nurse anesthetist, Maxwell Air Force Base, Montgomery, Ala., and C. H. Jeffers, McKesson Appliance Co., Toledo, O.

followers of the anesthesiologists who perfect the specialty and provide the leadership.—**Lillian Baird, R.N.,** Chief Anesthetist, University Hospital, Ann Arbor, Mich.

Anesthetists Needed For Private Office Surgery

Nurses Must Maintain High Standards

A huge discrepancy exists between the number of patients to be anesthetized and number of people available to handle the job. In addition to the hospital problem there is the problem of surgery performed in the private office where anesthesia is needed. Oral surgery is progressing, and with this progress grows a demand for good anesthesia.

If nurses anesthetists will maintain their high standards of training, good schools, and will accept qualified individuals into their membership, they can most certainly fill the appreciable gap between supply and demand. Nurse anesthetists should be paid while receiving their training, and it is felt that the one-year training period should be extended to 18 to 24 months to assure a sound, safe background.—**George J. Thomas, M.D.,** director of anesthesia, St. Francis Hospital, Pittsburgh, Pa.

The following is an abstract of a paper presented at the 41st clinical congress of the American College of Surgeons.

Minimize Atelectasis, Pneumonitis By Concentrating on Prevention

Light Anesthesia During Surgery

Postoperative atelectasis and pneumonitis are based on the retention of normal bronchial secretions and obstruction of the air passage. Both can be minimized by intensifying preventive efforts.

If surgery on the patient with respiratory infection cannot be deferred, he is prepared with antibiotics and bronchodilators. If secretions are increased, bronchoscopy is done. Drugs are administered judiciously to all preoperative patients.

During surgery, light anesthesia is maintained, and high concentrations of irritating gases are avoided. The pharynx, trachea, and bronchus are aspirated frequently through a cuffed intratracheal tube.

Postoperatively, opiates are given sparingly. Tight binders are eliminated. Early motion and coughing are encouraged. If inhibiting pain is present, intercostal block is done. Secretions are aspirated often. Hyperpnea is induced with 100 percent carbon dioxide or IPPB apparatus. Viscid secretions are loosened with aerosol, Mist-o-gen, or iodides.

If atelectasis or pneumonitis develops, in spite of preventive effort, treatment consists of bronchoscopy and antibiotics.—**Richard A. Theye, M.D.,** Rochester, Minn.

Above: Ethel Moir, nurse anesthetist, Lake Worth, Fla., Lillian Baird, chief anesthetist, University Hospital, Ann Arbor, Mich., Minerva McLane, nurse anesthetist, W. T. Edwards Tuberculosis Hospital, Tallahassee, Fla., sit chatting, while in the background Mrs. Evon Compton, Central Florida Tuberculosis Hospital, Orlando, and Mary Snively, Palm Beach Clinic, West Palm Beach, Fla., listen.

Abstracts of two papers from the 105th annual meeting of the American Medical Association in Chicago, June 11-15, 1956.

Hypothermia Reduces Surgery Hazards in Poor-Risk Patients

Extensive Procedures Tolerated; Less Anesthesia Required

Hypothermia reduces the hazards of surgery in poor risk patients, we found in 76 cases operated upon under moderate hypothermia.

Forty-nine were classified as very poor risks. Definite myocardial disease was present in 45 percent of cases. The age range was from 16 hours to 90 years. More than half were over 50 years old. Temperatures were reduced in all cases to between 28° and 32° C. The average was 30° C.

Hypothermia helps protect the patient by reducing cerebral metabolism by 40-75 percent. Patients looked better after surgery and acted more alert than would have been expected. They excreted a large volume of urine during the immediate postoperative period, and lost sodium instead of retaining it.

Poor-risk patients tolerated extensive surgical procedures well under hypothermia, and showed no ill effect from acute episodes of blood loss during surgical intervention.

Twenty patients operated upon under moderate hypothermia in conjunction with general anesthesia required 50 percent less anesthesia than 20 operated upon under general anesthesia alone. Patients who had hypothermia had immediate recovery in the operating room, while patients without hypothermia required one to two hours for recovery.

Once the patient is anesthetized, he is placed upon a water-cooled mattress. Arfonad (R) infusion 1:500 is used to prevent myocardial irritability during cooling and to convert premature ventricular contractions and arrhythmias into a regular rhythm.—**S. N. Albert, M.D.,** Washington, D. C.

Hypnotism Called Safest Method of Anesthesia

Reduces Amount of Chemicals Used; Can Aid Morale

Hypnotism is the only means of anesthesia which carries no danger for the patient. Every anesthesiologist should also be a hypnotist.

In the first reported case of lung surgery on a hypnotized patient, a tumor was removed from the lung of a 25-year-old woman under deep hypnosis, produced before surgery and aided by preparatory drugs. Hypnotic suggestions were continued during the two-and-a-half-hour operation, and the patient obeyed all instructions except the command to hold her breath. Because of this, a drug was administered to slow down respiration for about 45 minutes. The patient left the hospital in excellent condition a week later.

Previous operations under hypnosis had been confined to abdominal surgery, appendectomy, breast surgery, and amputations.

Used before an operation in which regular anesthetics are to be used, hypnosis makes the patient more comfortable, helps him to relax, and reduces excitement and fear. It raises his threshold to pain.

Actually, perfect anesthesia should be attained by employing hypnotism in conjunction with chemical agents. Hypnosis can be maintained for long periods and terminated at will, and places no extra load on the circulatory, respiratory, hepatic, or renal system.

As a means of sedation or as an auxiliary method of anesthesia, hypnosis reduces the amount of chemicals used. By itself, it can be used for incisions and drainage, short orthopedic operations, extraction of teeth, changing painful dressings, and removing stitches. It has been successful in improving morale and restoring appetite among badly burned men.

Perhaps the most valuable use of hypnosis is in post-hypnotic suggestion, which can relieve postoperative pain, reduce the amount of narcotics used, and help the patient to breathe deeply or to cough.

The best hypnotic subjects are ordinary normal people, the more intelligent and imaginative the better. Children usually make good subjects because of their heightened powers of imagination. Young people respond better than old, because their reaction patterns are not so rigidly set.

The only disadvantage to the use of hypnotism in anesthesia—the considerable time required—is more than offset by the many advantages.—**Milton J. Marmer, M.D.**, Chief of Anesthesiology, Cedars of Lebanon Hospital, Los Angeles.

Abstract from a paper presented to the Conference of Nurse Anesthetists, Upper Midwest Hospital Association, Minneapolis.

Intubation Anesthesia Not Advised for Children's Tonsillectomies

Local Analgesia Best for Adults

The anesthetic for a tonsillectomy must be safe for the patient, have facility of operation, and ease of administration. Too many feel that a tonsillectomy is a minor procedure. Actually many more complications can occur than usual—such as cardiac arrest, lung abscess, and pneumonia.

There is no one safest way to do a tonsillectomy. The greatest problem is the choice of anesthetic, and this includes proper maintenance of the airway. Endotracheal anesthesia is best for maintaining the airway, keeping blood and mucus from collecting, and making the administration of oxygen easier, but the technical difficulty in using the apparatus results in increased throat trauma and makes surgery on small patients much more difficult.

Intubation of the trachea is not without hazards, especially for children. It can be very traumatic to the laryngeal mucosa, and in the hands of the unskilled, the process can be more dangerous than the operation itself.

Insufflation anesthesia with ether and Vinethene is the best choice for children. It is safe, dependable, and easily controlled. Studies in 155 hospitals have failed to show difficulty in maintaining the airway and there have been no serious complications with this method.

Local analgesia is the method preferred for adults. If this is impossible, an endotracheal tube with a general anesthetic is advised.—**John B. Gregg, M.D.**, Sioux Falls, S. D.

Abstract of a paper presented at the ninth clinical meeting of the American Medical Association in Boston.

Light Anesthesia Effective In Surgery of Aged

Nitrous Oxide-Oxygen Used with Curare

Light anesthesia with nitrous oxide-oxygen and curare has proved effective for major surgery in aged patients or other "poor risk" patients who might be endangered by usual heavy anesthetics.

Our most recent operations were on 150 aged patients, most of them between 70 and 95 years old. We had no anesthetic difficulties. Satisfactory results were attained for all major types of surgery, lasting even as long as 10 hours.

Numerous poor-risk patients are now being operated on successfully, whereas only a few years ago we would have rejected them as suitable surgical candidates.—**Morris L. Heller, M.D., and T. Richard Watson, Jr., M.D.**, Dartmouth Medical School and Mary Hitchcock Hospital, Hanover, N.H.

Abstract of a paper presented at the annual meeting of Ohio State Association of Nurse Anesthetists, April 11, Columbus.

Technic of Giving Anesthesia Less Important Than Side Factors

Pre-Surgical Preventive Measures Needed Against Infection and Dehydration

As long as pediatric anesthesia is given well, the exact technic is not as important in the long run as the various side elements to be watched before surgery.

Routines do not apply in giving medication. Weight, physical condition, and age determine the amount of medication.

Children are prone to upper respiratory infections and should be watched carefully during their hospital stay. We advise hanging a sign on the crib warning adults to handle the child as little as possible, especially when he is being taken to several different departments.

The fluid intake is another important element before and during surgery. Infants lose fluid just during the time required for admitting procedures. They may go for hours with no fluid intake because of the lack of time or attention. We try to give fluids, sugar water, or fruit juice until about four hours before surgery. Children, then, must be worked into the surgery schedule at the proper time.

During surgery it is easy to give too much fluid. No more fluid is put in the flask than the child can assimilate at once in case these is an accident with the apparatus. About 10 cc. per pound is the limit.

Except for using hypothermia in cardiac surgery, we try to keep the children as normal as possible—especially their temperatures.

During the induction of anesthesia we use the smallest equipment available and try to get masks to fit the face.

In draining the gastrointestinal system, the size of the endotracheal tube is important. The tubing that will fit the external nares will usually fit the larynx. We keep one size larger and one size smaller on hand, in case the first is not right. The length of the tubing is important because it must be kept from entering the bronchi. One to 2 cm. is usually all right for a small baby.—**John P. Garvin, M.D.**, Chief of Anesthesia, Children's Hospital, Assistant Professor of Anesthesia, Ohio State University, Columbus.

Valuable information can be found every month in the O.R. Section, a regular feature of HOSPITAL TOPICS.

Multiple Autoclaving of Drugs Used in Spinal Anesthesia*

By

Allan B. Carter, M.D., Clarence L. Hebert, M.D.,
Wayne S. DeWald, M.D., and
Audrey W. Talley, M.D.**

The serious neurological sequelae of spinal anesthesia, although relatively uncommon, are of such a grave nature that every improvement in technic which might eliminate a possible etiological factor should be adopted. Sterilization of ampules of spinal anesthetic drugs by immersing them in colored antiseptic solutions has long been accepted as a means of insuring asepsis. However, many writers have suggested that dire neurological complications of spinal anesthesia might be attributable to the inadvertent introduction of these irritating solutions into the subarachnoid space (1-5). These authors, and many others (6-9), believe that ampules of spinal anesthetic drugs should be sterilized by heat.

In 1951, at the suggestion of Dr. Philip H. Sechzer, we decided to adopt the following technic. Individual trays containing an ampule of a specific spinal anesthetic drug, 10 percent glucose solution, a vasopressor drug and necessary equipment for subarachnoid injection were set up, autoclaved, and labeled.

We planned to have approximately 20 trays available each morning; it soon became evident that it was not always possible to have ready the necessary number of trays containing a given drug to meet the needs of a surgical schedule. Accordingly, extra packs of individually wrapped and heat-sterilized anesthetic solutions were provided for such an exigency.

*Reprinted by permission from **Anesthesiology**, Vol. 15, No. 5, September, 1954.

**From the Anesthesiology Service, U.S. Public Health Service Hospital, Staten Island, N.Y. Dr. Carter is now in Tucson, Ariz.; Dr. Hebert is medical director, Clinical Center, National Institutes of Health, Bethesda, Md.; Dr. DeWald is in Freeport, L. I., N.Y. and Dr. Talley is in Shreveport, La.

It developed that some ampules, after heat sterilization, had to be discarded or again autoclaved. Because we were under the impression that repeated autoclaving would decrease the potency of local anesthetic drugs, we decided to undertake a study based on the clinical use and chemical analysis of spinal anesthetic drugs which had been heat-sterilized on five separate occasions.

Lots of procaine (novocaine), 10 percent solution, in 2 cc. ampules, tetracaine (pontocaine®) in various strength solutions and crystals, and piperocaine (metycaine®), 5 percent solution, in 3 cc. ampules were autoclaved at 250° F. for 30 minutes at 20 pounds pressure. This procedure was repeated five times over a two-day period, the ampules being allowed to cool to room temperature between each autoclaving. The ampules were then sent to the manufacturers for analysis by their laboratories. It should be pointed out that these drugs, as purchased, had been heat-sterilized, except for the tetracaine "niphanoid" crystals which are packaged by aseptic machine filling. The results of chemical analysis are shown in table I. There was no significant alteration in these drugs after multiple autoclaving.

One hundred and eighty-six spinal anesthesias utilizing drugs that had been autoclaved five times were given during a three-month period starting in November, 1951. The majority of these were for lower abdominal operations, hernioplasties and appendectomies, on otherwise healthy males, although operations on the lower extremities and upper abdominal procedures on females and males were included. We have compared these with regard to duration of sensory anesthesia with 5,763 spinal anesthesias done in this hospital under similar conditions and for similar procedures, except that the drugs were sterilized in an antiseptic solution, from January 1946 until April 1949. Utilizing the criteria established in this larger group[10], we found no significant increase in the percentage of inadequate spinal anesthesia or failures.

In addition, we determined the duration of motor paralysis by sending to the recovery room for special observation 60 patients who had received spinal anesthesia with tetracaine, ampules of which had been heat-sterilized five times. Employing methods of evaluation similar to those used by Bonica[11] and Sergent and Dripps[12], with essentially similar amounts of ephedrine and total quantities, we made the following comparison. The tetracaine used by Bonica came from ampules that were sterilized in antiseptic solution; Dripps and Sergent autoclaved their ampules. No significant difference

Table I
Results of Chemical Analysis

Anesthetic Agent	Labeled Contents mg.	Amount Remaining After Multiple Sterilizations By Heat, mg.
Procaine, 10% solution	200 (in 2 cc.)	196.2
Tetracaine hydrochloride, 1% solution	20 (in 2 cc.)	19.6
Tetracaine hydrochloride, 0.3% and glucose, 6% solution	15 (in 5 cc.)	13.8
Tetracaine "Niphanoid" crystals	20	19.45
Piperocaine, 5% solution	150 (in 3 cc.)	149.7

is noted (table II).

To evaluate the possible adverse effects of spinal anesthetic drugs subjected to multiple autoclaving, we compared our series with the 5,763 cases previously mentioned with regard to complications, namely, headache, urinary retention, respiratory and gastrointestinal disturbances, and found that the incidence of postspinal complications was essentially the same.

Since the conclusion of the above study with drugs that had been autoclaved five times, we have continued to sterilize these drugs once by means of heat as a routine procedure, but do not hesitate to autoclave them again should the circumstances demand. From February 1952 until February 1953, 1,812 surgical procedures were done under spinal anesthesia, and it is the impression of the staff that anesthesia lasts as long, with no greater percentage of complications than when the drugs were sterilized in solutions.

We must point out, however, that there was a noticeable discoloration in tetracaine-glucose solutions and in ampules of 10 percent glucose solution subjected to heat sterilization. To the eye, the ampules of glucose as purchased and those autoclaved once could not be distinguished. After a second autoclaving, however, definite discoloration could be perceived. A small number of spinal anesthesias were performed early in our study using these discolored solutions, without apparent ill effects; this method was soon abandoned, however, and in the remainder of the procedures reported glucose solutions were utilized autoclaved but once. To confirm our impression of the changes produced in the glucose by autoclaving, we treated the ampules containing 10

Table II

Average Duration Motor Paralysis

	Bonica's Series Chemical Sterilization		Sergent & Dripps' Series Autoclaved Once		Authors' Series Autoclaved 5 Times	
Dose, mg.	Duration, Minutes	Number of Patients	Duration, Minutes	Number of Patients	Duration, Minutes	Number of Patients
6	188	36	—	—	168	7
8	195	29	—	—	194	30
10	210	56	198	218	213	23

percent glucose solution as indicated in table III, and attempted to determine the relative amount of color

Table III

Changes Produced in Glucose Solutions by Autoclaving

Sample	Optical Density	Glucose Concentration, mg.
As purchased	0.000	93
Autoclaved one time	0.040	90
Autoclaved two times	0.060	95
Autoclaved three times	0.101	94
Autoclaved four times	0.160	90
Autoclaved five times	0.238	90

change as revealed by optical density studies on the Beckman spectrophotometer, using an undiluted 1 cc. sample at 400 m. wave length. Simultaneous analysis of glucose concentration was performed by the Benedict-Wu method.

It should also be noted that the ephedrine that was added to tetracaine spinal anesthesia was similarly autoclaved but once. We do not know to what extent this drug would be altered by multiple autoclaving, although it has been used in several instances as a vasopressor, either intramuscularly or intravenously, after having been autoclaved five times, with no apparent deterioration in potency.

SUMMARY AND CONCLUSIONS

Spinal anesthesias were performed in 186 cases using drugs that had been autoclaved under 20 pounds pressure for 30 minutes at 250° F. for five consecutive times, without apparent change of potency in vivo or in vitro, or without any apparent increase in percentage of complications.

Usually ampules of spinal anesthetic drugs need be sterilized but once before use, but should they acquire additional processing, apparently they can be autoclaved up to five times without affecting the quality of spinal anesthesia.

Multiple autoclaving of glucose solutions results in a progressive caramelization. We do not know what adverse effects might result from the introduction of caramelized glucose into the subarachnoid space, since early in the investigation we decided against the use of obviously discolored glucose solutions.

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Results of British Study On Autoclaving Ampules

In another study, "The Effect of Autoclaving on Ampoules of Local Analgesics," published in *Anaesthesia* 9:271, 1954, the author, T. D. Whittet, reports the results of multiple autoclaving of:

Light Amethocaine
Heavy Amethocaine (Generically, Tetracaine hydrochloride—includes Pontocaine HCl, Amethocaine HCl, Anethaine, Decicain, Butethanol—ED.)

Light Cinchocaine (Generically, Dibucaine HCl—includes Nupercaine HCl, Percaine, Ainchocaine—ED.)

Lignocaine (Xylocaine hydrochloride plain)

Batches of ampules were autoclaved at 10 pounds per square inch pressure for periods of from one to six hours, and samples from each batch were examined for appearance, content of active constituent, pH, toxicity, and analgesic potency.

These properties were compared with controls as received from the manufacturers. Results showed that all of the drugs sampled would withstand exposure of 30 minutes to 250° F. for a single exposure without evidence of deterioration. Only one drug, amethocaine, showed a 10 percent drop in stated value after one hour at 10 pounds per square inch pressure.—**Dorothy W. Errera, R.N.**

An Inexpensive Anesthesia Equipment "Carry-All"*

By Gilbert Gross, M.D.

Preparedness and prophylaxis are two outstanding characteristics of today's anesthesiologist. Residents in training in anesthesia as well as anesthesiologists in private practice daily face the same problems of having proper and essential equipment readily available to handle the case at hand as well as the numerous emergencies that may arise.

Ideally, it would be preferable to have each room or department where anesthesia is administered fully equipped as an individual unit. In these days of ever-rising costs of medicine the most economical as well as the most efficient method of practicing safe, sound medicine must be considered. It is with these concepts in mind that the "Carry All" was developed.

The "Carry All" is a small, all-metal fishing tackle box available in almost any store for the modest price of $2.95. Its outside dimensions are 13¼" long, 6½" wide, and 6" deep. It has a self-closing hasplock which may be further secured by locking with a key. It has two shelves which swing out and in with the opening and closing of the box. These shelves are neatly subdivided into small, individual compartments, adaptable

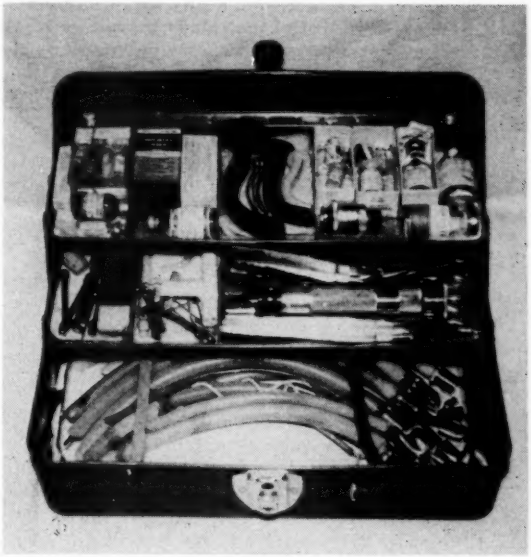


Figure 1

* Reprinted by permission from **Anesthesiology**, Vol. 15, No. 4, July, 1954.

to the accommodation of anesthetic equipment and drugs. The two swinging shelves overlie and clear bottom of the box by approximately 2½". This leaves another compartment, the full length and width of the box, available for storing more equipment.

In figure I the box is shown completely stocked with the necessary anesthetic equipment and drugs in a neat, precise fashion, portable and ready for instantaneous use. In figure II the entire contents of the box have been removed and spread out. A list of these items (carried constantly in this fashion) follows:

A. *Ampules:*

1. 10 cc. vial of atropine, 1/150 grain per cubic centimeter.
2. 10 cc. vial of tubocurarine chloride
3. 10 cc. vial of flaxedil® (2 bottles)
4. 10 cc. vial of Anectine®
5. 10 cc. vial of Tensilon®
6. 10 cc. vial of pronestyl® hydrochloride
7. 10 cc. vial of isotonic saline solution for injection
8. 30 cc. vial of seconal® sodium
9. 5 cc. vial of 1% neosynephrine
10. 5 mg. vial of regitine®
11. 1 cc. ampule of epinephrine 1:1000 (2 ampules)
12. 1 cc. ampule of cocaine
13. 1 cc. ampule of ephedrine (5 ampules)
14. 1 cc. ampule wyamine® sulfate
15. 1 cc. ampule 1:1000 prostigmine (6 ampules)
16. 1 cc. ampule scopolamine 2/75 grain (6 ampules)

B. *Ointments:*

1. ⅛ ounce butyn sulfate with metaphen® 1:3000
2. Boric acid 5% (ophthalmic ointment)

C. *Airways:*

1. One Guedel adult oropharyngeal
2. One Guedel child oropharyngeal
3. One Guedel infant oropharyngeal
4. One Lombard infant oropharyngeal

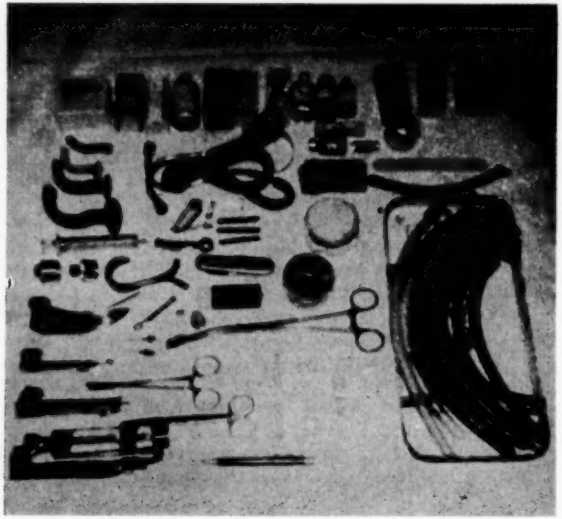


Figure II

5. Two nasopharyngeal airways, adult
6. Two tongue depressor blades

D. *Fittings:*
1. Two "T" (glass) connectors
2. One "Y" (metal) connector
3. Two "Y" (metal) connectors
4. One universal adapter
5. One Foregger chimney adapter
6. One plastic container of rubber tubing connections of assorted lengths and diameters

E. *Laryngoscopic equipment:* with adjuncts thereto:
1. One Wise-Foregger folding battery case
2. One Wise-Foregger blade No. 3
3. One Miller blade No. 1
4. One Guedel blade No. 2
5. One Macintosh blade No. 3
6. One scissors
7. One small hemostat
8. One 10 cc. syringe (nonsterile)
9. One ovum forceps bent for aiding in nasal intubation

F. *Endotracheal tubes with fitting:*
1. One Magill partex No. 9
2. One Magill partex No. 9h
3. One Foregger No. 36 (plastic)
4. One Foregger No. 40 (plastic)
5. One Foregger No. 34 (plastic)
6. One Murphy No. 36
7. One Magill partex No. 6
8. One Magill partex No. 4
9. One Foregger No. 22 (plastic)
10. One Murphy No. 20
11. One Foregger No. 14 (plastic)
12. One Foregger No. 10 (plastic)

G. *Miscellaneous*
1. One stethoscope with diaphragm attachment
2. One home-made infant open-drop ether mask

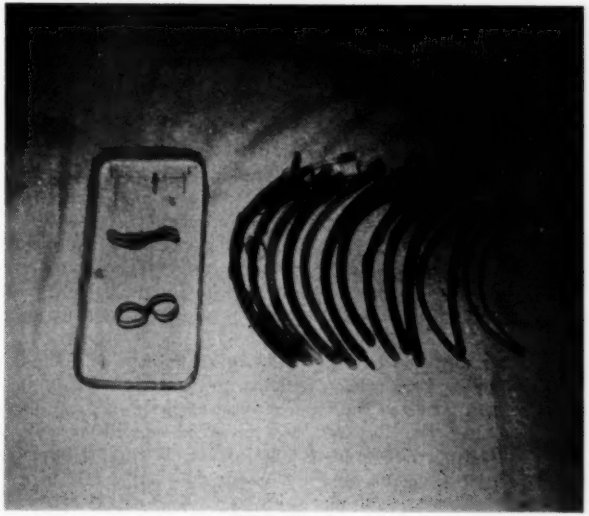


Figure III

3. One 2 cc. sterile syringe with No. 20 and No. 22 needles
4. One scout knife
5. Six large safety pins
6. One 2½" flat flashlight with batteries
7. One small roll of 1" adhesive tape
8. One ball-point pen.

In figure III the endotracheal tubes and their method of carriage are shown. They are assembled (aluminum stilets in place) in the inverted lid of an old bread box and encircled at each outer third by wide rubber bands. The tubes are placed according to size, in chronological order, from the top to the bottom in the lid, and are easily removed and replaced when the occasion demands.

The "Carry All" when fully loaded, as shown in figure I, weighs only 10½ pounds. It is light, compact and portable. It may quickly and easily be transported to the x-ray or cystoscopy departments, on the stretcher with a patient going back to his room, to the wards, or from operating room to operating room. The equipment present in the box permits the anesthesiologist to prepare for and carry out anesthesia for almost any type of surgical procedure, major or minor, pediatric or adult.

In addition to using the apparatus routinely for our daily surgery schedule, it has proved its worth in such emergencies as the resuscitation of the newborn (endotracheal ventilation), treatment of convulsion (adult and pediatric), and cardiac arrest. With this box, the anesthesiologist need not carry odds and ends in and about anesthesia machines or in pockets. All that is needed is a mobile anesthesia machine, the "Carry All" and the patient.

The O.R. Question Box

Q. What is the correct way to hold sterile forceps when transferring sterile supplies from one table to another?

A. Transfer forceps present multiple problems in asepsis and have been demonstrated as the source of contamination in an otherwise safe technic. The open container permits evaporation of the germicide; the rim of the container invites contamination from many sources; the choice of disinfecting solution is critical. The germicide must have an active vapor phase, be a fat solvent, and be non-corrosive. The conventional sponge stick used in many hospitals is awkward and clumsy to use.

Safety dictates that it be held in such a manner that germicide cannot run back onto the hand. This is an unnatural position that results in striking the forceps against other objects. The jaws of most forceps are not designed to grasp small articles or smooth rounded surfaces. As a result, many articles are dropped inadvertently. The cost of suture tubes destroyed in this way is preventable. A safe, easy-to-use transfer forcep is available and is described and illustrated in Chapter IV of "*Aseptic Treatment of Wounds.*"

Q. Please send me information on the proper procedure to prepare a hypodermic.

A. The important features of hypodermic medication are those related to the increasing incidence of homologous serum jaundice. This is transmitted by anything contaminated with blood or tissue fluid.

It is imperative that every patient receive his medication with a heat-sterilized syringe and heat-sterilized needle. Because the danger of contamination by negative pressure is possible in syringe-administered medication, the multiple-dose syringe must be abandoned. To date, no known chemical germicide is effective against the virus of this disease, and every syringe and needle must be terminally sterilized in heat before being handled.

Multiple-dose vials of medication should be avoided because the sterility of the solution is questionable after the bottle has been entered. Most hypodermic medication is available in single-dose vials and ampoules, and this technic should be encouraged in the interests of patient safety.

If the obsolete technic of preparing hypodermics from triturate tablets prevails, the tablet should be dissolved in sterile distilled water. The traditional hypodermic tray with a bottle of ageless water and a syringe and needle soaking in an unidentifiable solution should be abandoned in favor of methods which are less time-consuming and provide a greater factor of safety for the patient.

BOOK REVIEW

BASIC PRINCIPLES OF PARLIAMENTARY LAW AND PROTOCOL. By Marguerite Grumme, Registered Parliamentarian. Available from the author at 3830 Humphrey St., St. Louis. 44 pp. $1.

This small pocket manual presents basic information on parliamentary law in such a manner that it is an invaluable aid to both the experienced and inexperienced. The material is printed in clear and concise form, with many supplementary notes.

The manual contains the basic principles of parliamentary law, rules of debate, nominations, voting, elections, duties of officers, and types and rules of meetings and committees. It includes a basic chart of motions useful to the presiding officer, convention agenda, and basic protocol.

This is a ready reference, complete, but in convenient size for use in all meetings of clubs, societies, associations, etc.—**Edith Dee Hall, R.N.**

The following abstracts are of papers given at the American College of Surgeons' 41st clinical congress.

Blood Transfusion First Step In Gastrointestinal Hemorrhage

Hemoglobin, Hematocrit Poor Signs

The first element of treatment in gastrointestinal hemorrhage is blood transfusion—enough, given promptly and quickly. Vomitus reflects only a small part of blood loss. The greater part remains in the stomach and small intestine. The loss is always greater than expected and should be replaced within the first 12 hours.

Hemoglobin and hematocrit are inaccurate indicators. They depend on dilution, and today's hemoglobin reflects yesterday's blood loss.

In dealing with hemorrhage from anything but esophageal varices, a large lumen nasal tube into the stomach serves three purposes: (1) to empty the stomach of blood clot; (2) to facilitate drip feeding, and (3) to make aspiration of stomach contents possible, in order to detect further bleeding from the stomach or small intestine. Bleeding from the duodenum will reflux into the stomach and show in the tube contents.—**Charles F. W. Illingworth, M.D.,** University of Glasgow, Glasgow, Scotland.

Preparing Patient in Shock To Undergo Surgery

Focus on Most Severe Injuries

In a patient with multiple injuries, it is essential to focus on the most severe. In order, treat obstruction of the airway, sucking wounds of the chest, and shock by infusion of blood. Watch for signs of intracranial pressure, and, finally, immobilize fractures. Plasma alone may be administered in severe burns. Administration of oxygen is important. The patient should be moved gently and his position changed gradually to avoid sudden changes in dynamics.

For surgery, the patient will do best in a position of five to 10° of Trendelenburg. More may impair respiratory exchange. Minimal sedation is used, and morphine is injected intravenously to assure its being taken up by the patient's poor circulation. A general anesthetic is preferred; cyclopropane is best.

If the patient arrives in the hospital with a full stomach, the contents should be aspirated. An intratracheal tube inserted while the patient is still awake facilitates anesthesia and minimizes hazards of aspiration of stomach contents.—**William T. Fitts, Jr., M.D., Philadelphia.**

Abstract from a paper presented at the Illinois State Medical Society Convention, Chicago, May 15-18.

Emergency Surgery for Children Not Necessary in Majority of Cases

Treatment for Shock and Fluid Imbalance, Administration of Antibiotics Advised

The term emergency surgery has been stripped of its meaning of frantic thoughtless rush and now means treatment based on a careful approach because of the precarious condition of the patient and the unknown complications.

Emergency treatment for children may be required in accidents, acute illness, and emergencies in newborns. The few conditions which require immediate surgery are severe head injury, active, uncontrolled hemorrhage, and respiratory obstruction. It is not necessary to perform immediate surgery for appendicitis, intestinal obstruction, burns, fractures, and such neonatal defects as tracheo-esophageal fistulae.

Time should be taken to examine the child thoroughly for other illness or injury, to treat shock or fluid imbalance, administer antibiotics, and take other measures indicated to prepare the patient for surgery.

ACCIDENTS AND INJURIES

Fear and a full stomach are the two greatest problems in treating children who have been injured. They need skillful treatment with gentleness, assurance, and medical sedation.

Aspiration of vomitus continues to be one of the greatest dangers of anesthesia. We should find out what the child has eaten and when. After examination the safest methods are either to maintain the gag reflex by use of nitrous oxide or local anesthesia, or to induce general anesthesia and protect the trachea by passing an endotracheal tube and keeping it in place until the child awakens. The Pentothal-curare technic for quick intubation sounds ideal, but the resultant complete relaxation of the esophagus allows sudden regurgitation.

The added risk of shock must be considered in major injuries. Cyclopropane is best for pediatric use because of its pleasant odor, lack of irritation, speed of action, and potency. Its vasoconstrictive quality is also good for patients close to shock.

ACUTE ILLNESS

In acute surgical illness, patients must not be operated on while toxic and dehydrated. They should be treated first with antibiotics, fluids, and gastric suction. Operation is not indicated until the pulse is below 120, the rectal temperature is below 102° F., and urine is being passed.

SURGERY FOR NEWBORNS

Surgery on newborns requires only light anesthesia because the problems of excitement, full stomach, shock, or toxicity do not exist. The principal problem is to support the infant in his struggle for life. The anesthetist's first duties are to provide oxygen, fluids, blood, and warmth, and to prevent depression from position and external weights.

Babies are brought to the operating room in warm, covered bassinets. The limbs are wrapped in sheet wadding. A warm water bottle covered with a blanket is placed underneath the child. A cut-down is made at the beginning of every major procedure, and five percent glucose is started.

Local anesthesia, ether, or cyclopropane are the most frequently used anesthetic agents. Local anesthesia offers the most conservative approach. It has the advantage of greatest freedom from depression or complications, but often leaves the surgeon with a moving, unrelaxed subject. It is limited to very weak, listless infants who do not cry or resist treatment.—**Robert M. Smith, M.D.**, Children's Medical Center, Boston.

Abstract of a paper from AMA's 105th annual meeting in Chicago, June 11-15, 1956.

Simple Technic Facilitates Removal of Postnasal Pack

Uterine Curet Is Instrument Used

Removal of a postnasal pack is made easier with use of a different instrument—a blunt uterine curet which was used a few decades ago but is now obsolete. The instrument has a small, smooth ring tip and a flexible shaft. The distal end is bent at an angle of 110°, and the ring tip is positioned parallel to the shaft.

The instrument is threaded over the string and advanced along it until the pack is reached. The pack is then secured to the tip of the instrument by exerting a moderate amount of tension on the string. The plug is dislodged by a steady downward pressure on the curet handle, and is forced into the oropharynx, from which it is removed by a hemostatic forcep or by the patient himself.

The three main advantages of this method over conventional methods are: (1) it is simple—it can be learned by anyone with a minimum amount of instruction; (2) it can be carried out with less discomfort to the patient and without an anesthetic; (3) there is less danger of traumatizing the nose.—**Bernard Weston, M.D.**, Detroit.

● *Over 5,672 surgeons and guests from all parts of the free world attended the four-day combined 10th biennial congress of the International College of Surgeons and the 21st annual congress of the United States and Canadian Sections held in Chicago recently. Paper follows.*

Cobalt in Sutures Halts Spread of Bladder Cancer

Supplies More Accurate Radiation To Localized Area

Radioactive cobalt in the form of nylon sutures is being used as a barrier to the spread of cancer of the bladder.

This procedure, used for four years, has been applied to 22 patients. Five have died—two from causes other than cancer, and three from cancer which has spread to the liver. One is alive a year after surgery, but is believed to still have the disease. The other 16 are well and have been free from disease for three months to four years.

The 16 patients treated with radioactive cobalt whose

lesions are confined to the bladder wall now have normal bladders and void normally.

With radioactive cobalt in nylon suture form, the cancer of the bladder can be destroyed at its outer margin, where it is actually invading tissue. In this form, the cobalt supplies a more accurate radiation to a localized area, and achieves results obtained by total removal of the bladder. And the patient is left with a normal urinary tract.—**Vincent Vermooten, M.D.** Associate Professor in Urology, University of Texas Southwestern Medical School, Dallas.

Cadaver Homografts Found Successful In Treatment of Burned Children

● Cadaver homografts are being used successfully in the treatment of severely burned children at St. Francis Hospital, Evanston, Ill., by a plastic surgeon, Frank W. Pirruccello, M.D. This method has also been used extensively at Barnes Hospital, St. Louis. It involves "bandaging" granulating areas with strips of cadaver skin.

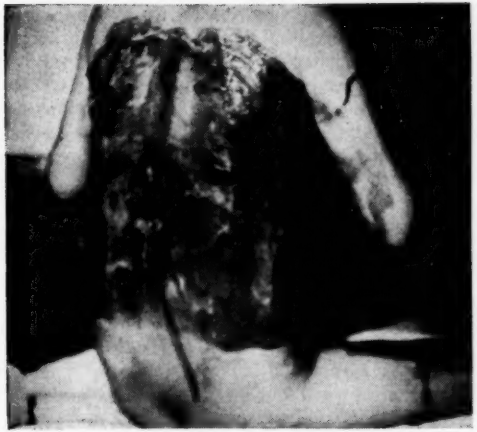
Cadaver homografts are used when there is not enough of the child's own skin available for grafting and when to wait until enough was available would mean converting the injury into a chronic one. In such circumstances homografts from parents or other close relatives are usually used. Unfortunately, such homografts are difficult to obtain in sufficient quantity and are frequently unsuccessful because immunity builds up so quickly. Cadaver homografts, on the other hand, take almost immediately and survive from four to six weeks. They have been used successfully in healing both acute and chronic burns.

Cadaver skin is plentiful for use. Relatives of the deceased usually cooperate readily when the purpose of the grafting is explained to them. It is necessary only to make sure that the deceased died from a noninfectious or noncontagious disease.

Although theoretically cadaver skin can be kept for as long as seven days under ordinary conditions, Dr. Pirruccello prefers to use it as soon as possible—within six or seven hours after death. The cadaver to be used is taken to the operating room, scrubbed, prepared and draped, just as a live patient would be. Skin is taken from the legs and lower extremities in light strips—between one eight-thousandth and 12,000th of an inch in thickness.

Immediately afterward, the patient is brought in, pre-

Dr. Pirruccello watches Barbara Youck, R.N. (l.) and Sister M. Luciana, O.S.F., pediatric supervisor at St. Francis, reinforce a completed pressure dressing. A posterior molded splint has been incorporated in the leg dressing here to prevent foot drop, allow normal knee action.

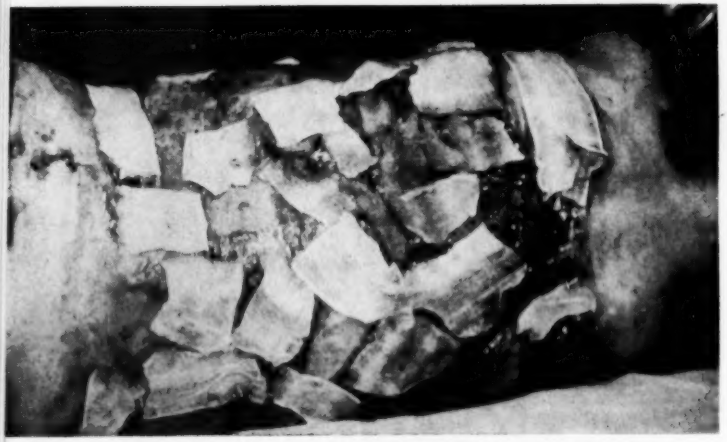


One of the patients treated by Dr. Pirruccello pictured upon admission to St. Francis, four months after initial burn. There was 58 percent full thickness skin loss over the body, including some unhealed donor sites over left and right lower extremities.

pared and transfused. Transfusions play an important role in the treatment of burns, Dr. Pirruccello believes. Whole blood and plasma are used frequently in the acute stages; the patient's blood volume is replaced many times over.

Unburned skin from the child's own body is next removed and cut up into small postage-stamp pieces. This skin is scattered over the granulating areas in a checkerboard fashion and marked with opaque dyes so that homografts will later be readily distinguishable from autografts.

The cadaver skin is placed between the autografts—laid on in strips exactly like bandages. These strips of cadaver skin immediately seal off the burn area and the healing process begins. Eventually this cadaver skin will fall off and new skin growing from the many tiny autografts will spread and cover the entire area.



Closeup view of freshly applied cadaver skin grafts applied to child's back. Fresh cadaver skin is very pale, actively growing cadaver skin grafts are somewhat darker in color and growing autografts are very dark in color. This is a graphic representation of conversion of an open wound into a closed one.

It is known that immediately after application of the homograft there is a diffusion of lymph from donor to graft. Weeks later blood vessels attempt to invade the graft, thrombosis occurs, and the graft is thrown off. By this time, however, the autografted skin has a healthy, living surface on which to grow. It is possible to strip off still-growing homografts, if necessary, and replace them with additional autografts. These grow readily in the vascular bed left by removal of the viable homografts.

Once the grafting is completed, compression bandages are applied. Open treatment of burns is usually impossible during the immediate growth period of the fresh graft, and in cases in which large circumferential areas of the body have been burned. It is also impractical, Dr. Pirruccello believes, unless a hospital has a special burn ward and specially trained personnel. Compression bandages, properly applied, are excellent for children. They are more comfortable and it is easier for the patient to move around.

NURSING CARE

Nursing care of burned children consists primarily in keeping them quiet and encouraging them to eat. Bed sores must be guarded against and extra precautions taken to prevent contamination.

The pressure bandages are changed as necessary and remain on for three to four weeks. Usually during that time attention is concentrated on building the child up nutritively. He is put on a high protein diet. A special effort is made to give him what he likes to eat and to

serve it to him as attractively as possible. Sister M. Luciana, O.S.F., pediatric supervisor at St. Francis, even encourages mothers to prepare their child's favorite food and bring it to the hospital. She also has a special "malted milk" prepared in the diet kitchen for fussy youngsters. It consists of ice cream, milk, and Protenum, and is served to the children as a between-meal treat.

For children in the acute stages, who are frequently thirsty, a drink of normal saline and 7-Up on cracked ice is used. This replenishes fluid supply without taking away needed salt.

CONCLUSION

As the treatment progresses, additional autografting can be done if needed or the child discharged, to return later for Z-plasty or plastic or reconstructive work. Meanwhile, the cadaver homografts have prevented an acute burn from becoming chronic or have sealed off a chronic burn. By immediate coverage and sealing off, the patient has less pain, is more comfortable and is thus able to make a more rapid return to health and vitality.

The debility period for an acute burn patient brought in immediately for treatment (and where autografting can be carried out within two weeks) is considerably shortened. Average hospital stay for such youngsters is four weeks. For those whose burns have become chronic the length of stay is roughly three times as long.

Dr. Pirruccello believes that cadaver homografting is the best method for effectively treating extensive and debilitated chronic burns and hopes that its use will become widespread in the near future.

Pressure dressing in position before final circumferential wrapping is carried out. This picture demonstrates the voluminous amount of dressing required to create a truly compressive type of dressing.

Evanston Hospital Finds Burn Packs Valuable Time-Savers

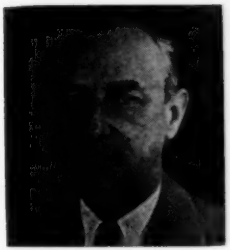
• Special burn packs, autoclaved as a unit, are kept on hand for o.r. use at St. Francis Hospital, Evanston, Ill. Appropriate dressings for burn victims are always instantly available.

Two or three packs of varying sizes are autoclaved each week. When a dressing is to be applied, the magnitude of the burn is determined, and an appropriate pack opened. All burn dressings are done in the operating room.

At right is a typical burn pack. It contains: doctor's gowns; 3" rolls of fine mesh roller gauze; 4"x4" gauze dressings; five yard coarse mesh gauze rolls; elastic bandages; rubber gloves; sterile towels; sterile drapes; large dressing pads (Abd. type). Vaseline gauze, also used on occasion, is obtained separately.

In emergencies, burn packs such as this save much valuable time. They are particularly recommended for children's hospitals and pediatric units, since the majority of burn victims are children.

Aortic Resection with Homograft



By Herbert D. Adams, M.D.*

All aspects of nurse training today have become very complex—particularly in the field of surgery. A good illustration of this is the recent and rapid development of the field of cardiac and vascular surgery. With each development the nursing staff must acquire at once a good knowledge of the complicated procedures, of the variety of new materials involved, such as new instruments and suture materials, and of the procurement and utilization of the homografts themselves.

Moreover, these operations are exceedingly long and tedious and try everyone's patience. They require scrub nurses who can stand six to 10 hours of intensive, hard work during which everyone in time becomes fatigued under nervous tension and even short-tempered. In other words, many of these operative procedures require many adjustments in the nursing programs to cover them satisfactorily from everyone's standpoint.

This new field of cardiovascular surgery, and particularly the use of homografts, is probably just the beginning of a much broader field of transferring other tissues and replacing other organs in the body. This has already been done, of course, in identical twins. Tissues other than blood vessels have been destroyed by the recipient body and the complicated reactions set up against such foreign material. These involved processes will undoubtedly be understood in time, so that there can be a free transfer of all types of tissues from body to body. As this big field develops, many changes naturally will occur in the operating room to keep pace with it, and the Association of Operating Room Nurses will be in a position to help make such wonderful progress.

Our best example of this new field is in aortic surgery, particularly in resection at various levels and replacement with either a homograft or, more recently, some type of plastic material.

Our first experience with resection of the aorta, following considerable experience in World War II with vascular surgery associated with traumatic injuries, was with the resection of coarctation of the aorta—a stenosis of the aorta just beyond the left subclavian artery and usually at the level of the ligamentum arteriosum. This type of surgery was delayed for many years because it was felt that there would be almost certain spinal cord damage when the aorta was shut off

*Dr. Adams is with the department of surgery, Lahey Clinic, Boston. This paper was presented at the third annual conference, Association of Operating Room Nurses, Boston, January 30-February 1, 1956.

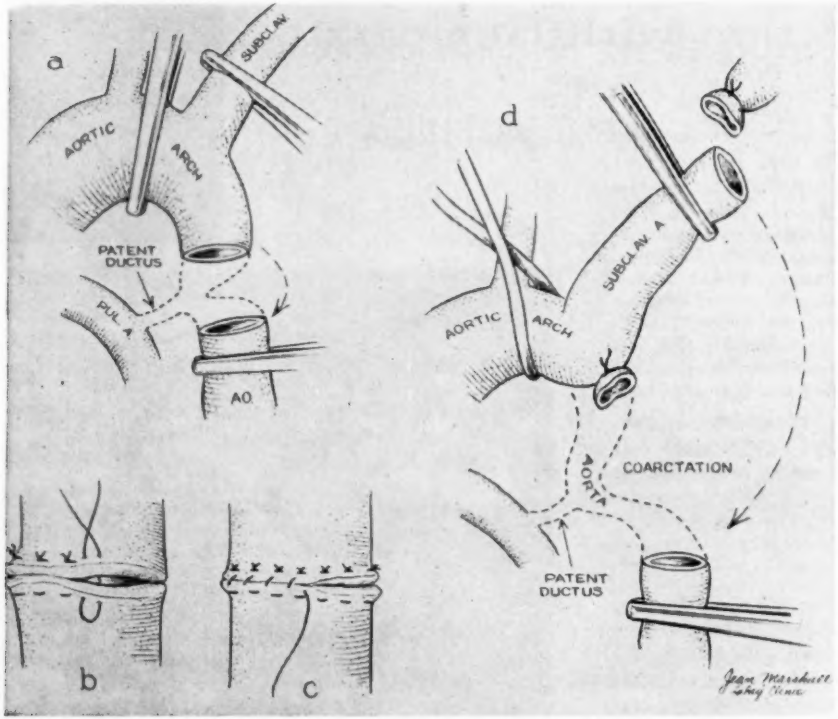


Fig. 1. a, Resection of the coarctation and primary end-to-end anastomosis of the aorta. b, Detail of end-to-end anastomosis, everting interrupted sutures around the entire circumference. c, Everted edges reinforced with continuous sutures, each covering half the circumference. d, Resection of coarctation and mobilization of subclavian artery for end-to-end anastomosis with descending thoracic aorta.

during resection and anastomosis. However, with the vast collateral circulation associated with coarctation, this has been a safe procedure in most cases.

Our experience with resection of coarctation has been primarily in adult patients in whom the aortal tissues, because of hypertension and arteriosclerosis, are very friable and inelastic, and we had to develop a new method of suturing which could be relied upon not to break down and leak, which, of course, would be fatal. We have developed anastomotic sutures which consist primarily of interrupted everted mattress sutures around the entire periphery and then continuous sutures whipped over these everted edges.

SAFE, RELIABLE METHOD

This method of anastomosis of the aorta has proved to be very safe and reliable, and many adults with coarctations have been operated on utilizing either an end-to-end anastomosis after resection or, in some instances in which the stenosis was long, turning down the subclavian to bridge the gap. *(See Fig. I.)*

With this important basic knowledge of how to resect and re-anastomose the aorta, consideration of the surgical treatment of other diseases of the aorta gradually developed. One of the most important, of course, is aneurysm of the aorta at various levels. It has long been known that the very best treatment would be to remove this badly diseased section of the aorta and replace it with some other structure if possible. This entailed so many serious potentialities, however, that the early surgical treatment of aneurysm consisted primarily of attempts to control the progressive enlargement and eventual rupture of such weakened walls by introducing many feet of fine steel wire in the form of a pack upon which a thrombosis could develop which would ultimately be organized by scar tissue, and secondly, of developing some method of external support applied in the form of a plastic tissue wrapping the aneurysmal portion of the aorta.

These methods were not very effective, although in many instances they did check the steady progression of the aneurysm for a short period. Eventually, however, most of the aneurysmal sacs continued to weaken and finally ruptured, resulting in the patient's death.

To illustrate the development in this field of surgery, in one case in which there was a huge aneurysm of the arch of the aorta *(Fig. II)* we did a wire pack and polythene wrapping some years ago with some improvement and control of the aneurysm for a few years. Eventually the aneurysm began to enlarge again and the patient began to have more pain.

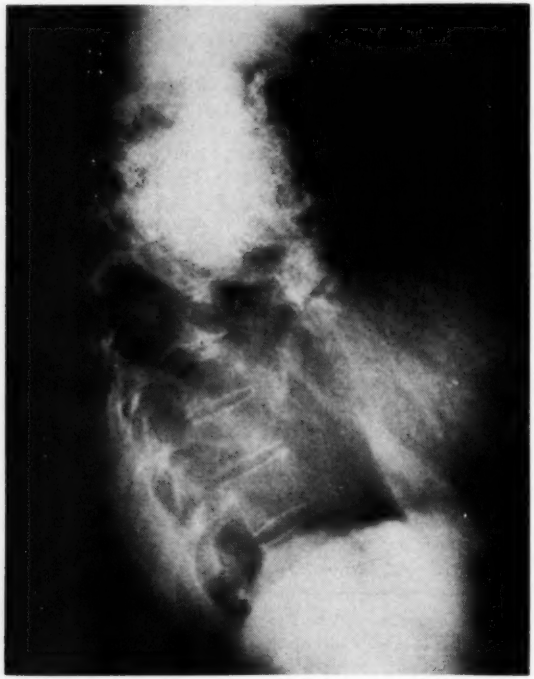
By this time resection and homograft were feasible. Therefore we again operated on this patient and established a homograft shunt around the aneurysm in order to preserve the circulation to the distal aorta and particularly to the spinal cord throughout the long period of time that the aorta was shut off during the resection of this huge aneurysm. This shunt has been utilized at various levels to maintain circulation during resection and replacement with homografts of these large aneurysms at the higher levels.

OBTAINING THE GRAFTS

Obviously, one of the most important parts of this procedure is the utilization of the homografts. How

Fig. 11. Lateral roentgenogram showing huge aneurysm of arch of aorta with erosion of upper thoracic vertebrae. Wire pack inserted at previous operation can be clearly visualized.

—*J.A.M.A.*, November 19, 1955



these grafts are obtained and how they are used in operating rooms should be of interest to operating room nurses, since they may have some definite responsibility in this respect. These homografts are obtained preferably from young adults under 40 years of age, although, because of the great need for more and more such material, we do not specifically limit the age at the present time, as long as the aorta does not have too much arteriosclerosis.

The aorta is best removed within six hours of death. The cause of death is not important. No aseptic precautions need be taken in removing these tissues. The aorta is removed completely in two sections, a thoracic portion down to the renals and the abdominal part from above the renals down to include the bifurcation of the iliac vessels. These two sections are washed off in water, dried, and laid flat in a narrow envelope of cellophane which is heat-sealed at each end.

This envelope is then placed in a second envelope of slightly larger size which is also sealed at each end. These grafts are then immediately placed in the freezer at –32° F. and must not be allowed to thaw out until they are used.

A most important part in processing these grafts is their sterilization. Previous methods of preservation and sterilization were extremely complicated because the grafts had to be maintained in a nutrient material and antibiotics had to be applied at frequent intervals. The Navy has developed an excellent method of preservation known as the "freeze-dried" method. The method we use to produce complete sterilization consists of

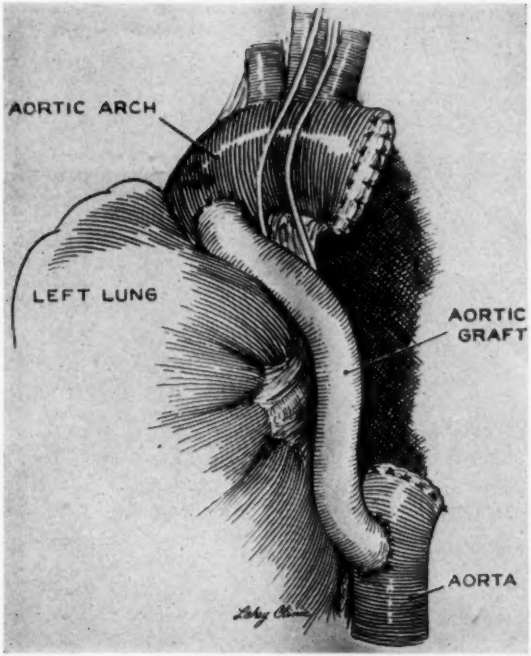
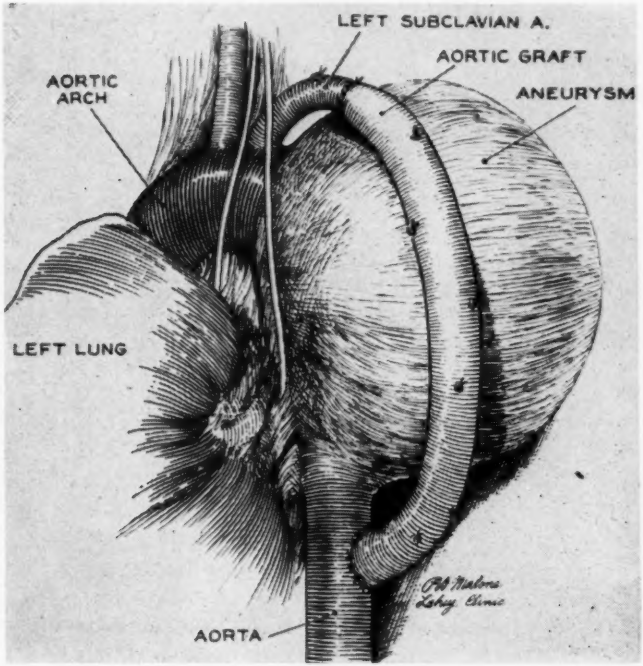


Fig. III. Aortic graft established between ascending aorta and aortal distal to aneurysm.

—J.A.M.A., November 19, 1955

Fig. IV. Functioning aortic graft established between left subclavian artery and aorta distal to aneurysm prior to resection of aneurysm.

—J.A.M.A., November 19, 1955



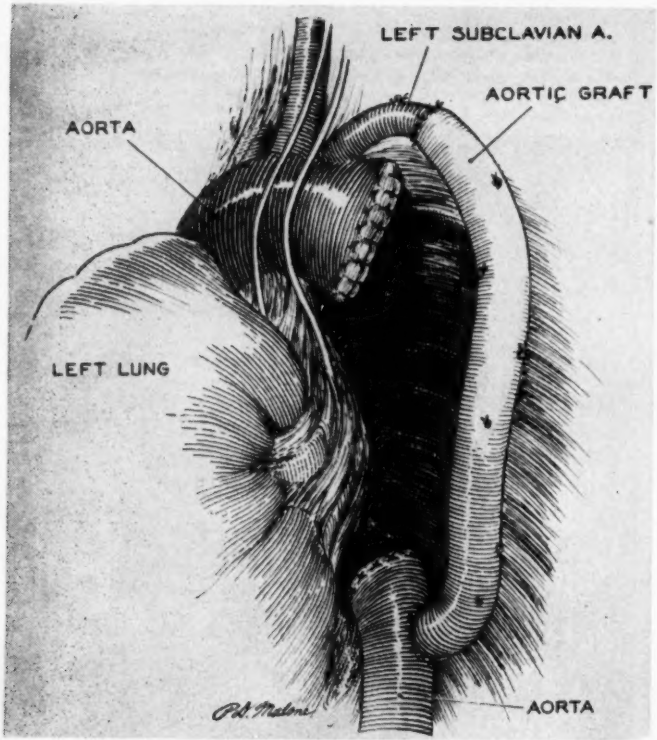
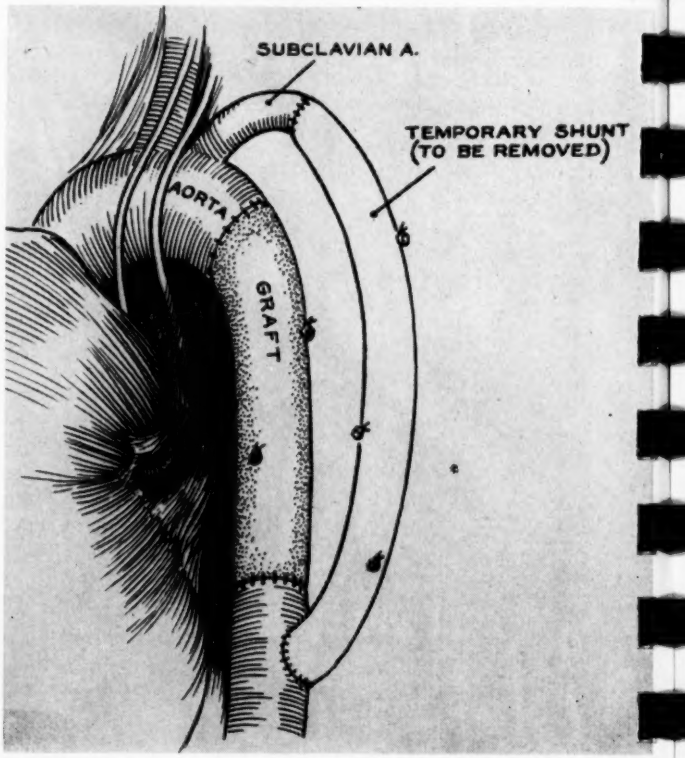


Fig. V. Relationship of aortic graft to aorta after resection of aneurysm.

—*J.A.M.A.*, November 19, 1955

Fig. VI. If the transected ends of the aorta are not too diseased, a homograft is anastomosed in the defect, re-establishing the normal aortal channel. The temporory shunt is then removed.

—*Surg. Clin. N. America*, June, 1956



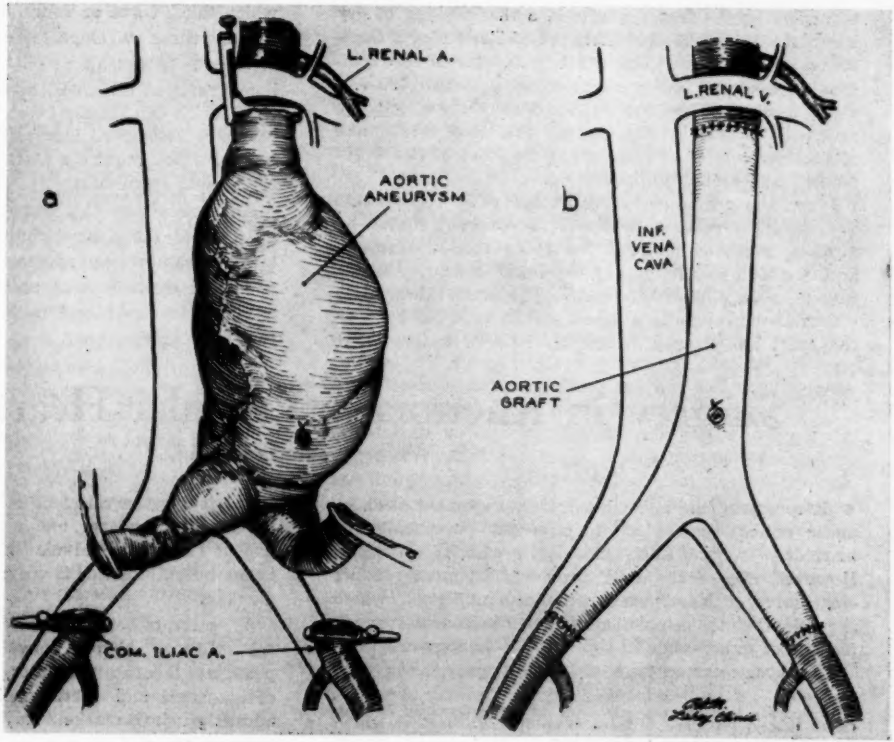


Fig. VII. *a*, Clamp is usually closer to left renal artery than is indicated in the drawing. The aneurysm has been freed from the inferior vena cava. The iliac arteries are transected before the sac is separated from the left common iliac vein. *b*, The three anastomoses have been completed.

—*Surg. Clin. N. America*, June, 1956

transporting the frozen grafts in a thermos jug of dry ice to the Massachusetts Institute of Technology, Cambridge, Mass. There they are exposed for a few minutes to cathode rays generated by the 2,000,000-volt x-ray machine. They are not allowed to thaw, but are returned in the thermos jug to the deep freeze and maintained at -32° F. They can be kept at least six months and probably indefinitely.

When the grafts are used, an operating room nurse goes to the freezer and selects the one designated by number, removes it from the outer sterile envelope, and, without contaminating the inner envelope, transfers it to the instrument table. The scrub nurse then places the envelope in a warm saline bath. As soon as the graft has thawed sufficiently so that it is pliable, which takes three or four minutes, it is removed from the polythene envelope.

Since it is difficult to get adequate numbers of such homografts at all times, certain types of plastic materials which can readily be sterilized by the usual methods have been used increasingly instead of the homografts, which require a certain amount of care in processing and sterilizing.

As a result of this important utilization of homografts and these plastic materials, aneurysms at all levels have now been successfully resected and replaced, and other diseases, such as thrombotic obliterative disease of the aorta and major vessels, have also been treated in this manner.

Surgery in Rheumatic Valvular Heart Disease

By Wilford B. Neptune, M.D.*

● Recent progress in the medical management of rheumatic patients has much to offer for preventing the morbidity and mortality associated with this disease. However, one of the chief problems frequently is an obstructive or incompetent valvular component, which is predominantly mechanical. In such instances surgery may be of great value in the over-all management.

The most common type of heart surgery being done today is for the relief of mitral stenosis. In considering surgery, however, one must manage the entire problem of rheumatic valvular heart disease, since, all too often, mitral stenosis is only one component of valvular damage.

All patients being evaluated for surgery have a careful study by history, physical examination, and appropriate laboratory studies, including roentgen studies of the heart and electrocardiography. In certain cases additional information may be obtained by cardiac catheterization.

*Dr. Neptune is a surgeon associated with the Overholt Thoracic Clinic, Boston. This paper is based on an illustrated lecture given at the third annual conference, Association of Operating Room Nurses, Boston, January 30-February 1. 1956.

In the past, right-heart catheterization has been employed, but since most acquired lesions involve the left side of the heart, this study is often inadequate. At the present time we can catheterize the left side of the heart by passing a needle through the posterior right side of the chest under fluoroscopic guidance and entering the left atrium directly. Then a small plastic catheter is threaded through the needle, and pressures, pressure pulse contours, and blood samples may be taken from the aorta, left ventricle, and left atrium. Obviously, when such a study is combined with right-heart catheterization in a patient who is awake, and with an intact thorax, an adequate evaluation of the over-all cardiac status may be obtained.

We are using left-heart catheterization preoperatively on all cardiac diagnostic problems, and, in general, on practically all of our rheumatic valvular patients. In addition, the study may be performed postoperatively in evaluating surgical results and as an aid in future prognosis.

WHEN SURGERY IS INDICATED

We feel that surgery is indicated for mitral stenosis in the presence of symptoms, x-ray evidence of left atrial enlargement, and anatomical diagnosis of mitral stenosis, and in the absence of a suitable contraindication. We do not advise surgery for the asymptomatic patient.

Since the surgical procedure is fairly well standardized as to technic and results, we feel that once symptoms are present, surgery is indicated before further progression and complications have occurred. As progression occurs, the morbidity and mortality from surgery increases, and the more favorable results decrease.

At the present time, with relatively pure mitral stenosis, the mortality from surgery is less than two to three percent among Class II and Class III patients and not more than 15 percent among Class IV patients. Of those surviving, 70 to 90 percent are improved or satisfactorily rehabilitated.

Patients with mitral insufficiency are a most difficult group to manage. Various surgical procedures have been tried, none with the success comparable to that for mitral stenosis. We feel that those methods for decreasing the size of the mitral annulus have the best potential for success. Due to the lack of a completely satisfactory operation, we do not recommend surgery for mitral insufficiency unless there is difficulty in management under a good medical program.

Patients with tricuspid stenosis are managed for surgery through the right thorax for easy access to the right atrium—comparable to mitral stenosis through the left atrium. In the presence of combined mitral and tricuspid stenosis, we prefer the right thoracic approach for both lesions at a single operation. The mitral lesion is handled by entering the right lateral wall of the left atrium through the right thorax. We believe this is preferable to exploring the tricuspid valve from the left thoracic approach.

Other indications for handling mitral stenosis by the right thoracic approach, in our opinion, are an associated right pulmonary problem requiring surgery, or the presence of Lutenbacher's syndrome (congenital

interatrial septal defect and acquired mitral stenosis). In these instances the associated lesions can be managed at a single operation. In addition, if there is combined mitral and aortic stenosis, both lesions may be managed from the right chest—the mitral as explained above and the aortic as described below.

Patients with aortic stenosis present a very difficult problem. They have a disease which from the beginning has damaged the left ventricle—the keystone of the heart. They may go 15 to 40 years without symptoms; but, once the symptoms of angina, vertigo, syncope, and dyspnea occur, they have a life expectancy of less than two years. Therefore, once these symptoms develop, surgery should be considered. After evaluation, if there are no definite contraindications, surgery should be done.

The surgical management of aortic stenosis is changing. Because of the associated valvular calcification and left ventricular damage, there is a higher mortality and a less satisfactory end result than in mitral stenosis. When evaluating the over-all problem and the eventual prognosis, however, we feel that the results are quite good.

The aortic stenosis may be relieved by passing a dilating instrument blindly through the left ventricle. Good results have been obtained by this method. However, it is blind because one does not really know at the time of surgery what has been done, and the operative mortality has been about 30 percent.

At the present time the preferred approach is retrograde through the ascending aorta. A suitable pouch is attached to an opening in the ascending aorta, and then, by means of adequate hemostatic control, one may manage the aortic valve by finger pressure or a suitable instrument comparable to mitral valve technic. By this approach the mortality has been decreased to 15 percent, which seems reasonable in view of the over-all problem.

Aortic insufficiency is a most difficult problem in management—again, quite similar to mitral insufficiency in severity. In our opinion, at the present time, the only satisfactory operation is the insertion of a plastic valve (Hufnagel) in the descending thoracic aorta.

This valve is distal to the coronary, head, and upper extremity vessels, and, therefore, is only palliative at best. However, it will prevent regurgitation of about 70 percent of the cardiac output.

We advise surgery only in those patients progressing and becoming unmanageable on a good medical program. It is our hope that this procedure many answer the problem in a particular patient, or, at least, palliate the patient until a more adequate procedure is available.

Surgery is only a part of the over-all management of these particular patients. We feel much can be done for many patients. Often complete rehabilitation is possible. They still have rheumatic heart disease, however, and will require cardiac supervision for the duration of their lifetime.

Effective Leg-Holding Device Aids Prepping

By Mrs. Jean MacCready, R.N.*

● Our surgical nurses no longer have to hold heavy legs while the legs are being prepped for surgery. They now have a leg-holding device, designed and built by the hospital's chief engineer.

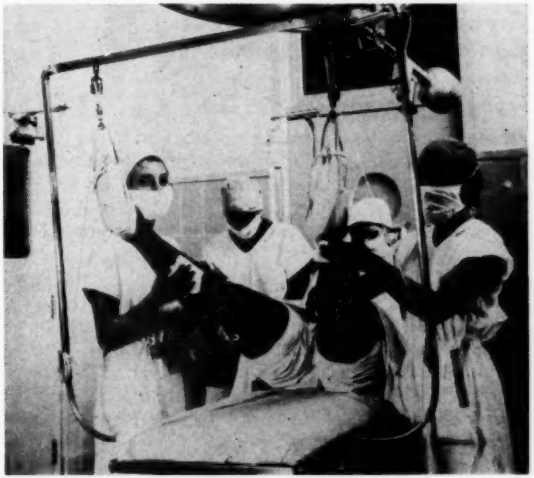
In designing the apparatus, our engineer, P. N. Keay, and I considered many problems. First, the frame should be movable along the length of the table. This was accomplished by designing the side poles to fit the attachment holders located on the sides of most operating room tables. Second, the frame had to be designed to allow ample elbow room for nurses to complete their preps properly. This was accomplished by curving out the upright poles.

To facilitate easy cleaning and storage, the crossbar is attached to the uprights by standard elbow pipe fittings. The crossbar itself has five sets of notches. These permit the spreading of the legs to any desired distance.

For suspending the legs from the crossbar, we teamed with the housekeeping department and designed a zipper-on boot. The feet are placed in the boots, the pullies spread to the desired distance, and the legs pullied up to the desired height. The cords are then secured to cleats welded to the lower portion of the uprights.

Previously, four nurses were required to prep a bilateral vein ligation—two to hold and two to prep. Now only two are necessary. This led to another advantage. Many times it becomes necessary to do awkward cases in small rooms. The elimination of nurses for holding legs offers the operators and circulators a great deal more space.

Although the apparatus has been in use for only a



*Mrs. MacCready is operating room supervisor, Highland-Alameda County Hospital, Oakland, Calif.

short time, surgery nurses find it so valuable that they hesitate to release it to the engineering department for chroming.

Mr. Keay says that he will be glad to mail plans for the frame to any hospital that might be interested in building a similar frame for its surgery. His address is: P. N. Keay, chief engineer, Highland-Alameda County Hospital, Oakland, Calif.

A paper presented at the Mid-West Hospital Association follows.

Grounding Is Best Means of Controlling O. R. Explosions

Administrator Should Set Up Rules for Clothing Worn in O. R.

Of the eight million operations performed in the United States each year, we can expect a fire or explosion in one out of 50,000 to 80,000. Approximately 80-120 persons are going to be hurt a year, and 30 percent of that total will die on the operating table as a result of explosion.

Many factors are responsible for explosions—flammable agents, a source of ignition, smoking, x-ray, cautery, diathermy, poor electrical wiring, electrostatic discharge, oxygen, and human carelessness.

The best means of precaution are grounding everything in the operating room, controlling humidity, insisting on proper clothing for all personnel, and avoiding hazardous areas.

One effective grounding device is a wet towel placed under the patient, attached to the operating table and then set at the base of the table attached to the floor. The anesthetist can be grounded by wearing perfectly clean conductive shoes or conductive strips. Going barefoot is really preferable, but grounding is essential.

Freshly laundered cotton clothing must be the only material permitted in the operating room. Wool, silk, and rayon should be condemned. It is up to the administrator to set up rules for this and see that they are followed.

All those not involved in the administration of the anesthetic should stay as far away from the head of the table as possible.—**Paul H. Lorhan, M.D.**, Professor of Anesthesiology, Head Section of Anesthesiology, University of Kansas Medical Center, Kansas City.

Q. Our hospital is having quite a problem with regard to the accepted lighting technic for doing T&A in the operating room, when explosive anesthesia is employed and the surgeon uses a head light. So far as we could determine, no manufacturer makes an explosion-proof head light.

A. An explosion-proof illuminator is commercially available for those who wish to use head mirrors in the operating room. Any low-voltage head light is safe for use in the operating room, provided that it conforms to the requirements of N.F.P.A. Bulletin 56, Sections 5-21.

In essence, this section specifies that the voltage shall not exceed eight volts. The source of the current can be batteries. If 110-volt current is used as the power source, an isolating transformer with a grounded

cord must be used to reduce the voltage. The use of resistance devices to reduce the voltage is prohibited.

Q. I would appreciate your opinion regarding the use of radio in an operating room from a standpoint of explosion hazard, noise and distraction.

A. A properly installed radio should not constitute an explosion hazard. While I agree with you that a radio is distracting, I presume that there are those who enjoy the rhythm and pay little attention to what we might consider noise.

With an anesthetized patient, I presume that the use of the radio becomes the surgeon's choice. If the patient is not anesthetized, however, I would feel that his desire should be paramount.

Q. With summer months approaching, what are the complications, including explosive hazards, of air conditioning an operating room?

A. Ordinary package units are the most satisfactory way of air conditioning operating rooms in an old institution. As long as these units are located five feet above the floor they do not constitute an explosion hazard. Because they can be individually controlled to suit the requirements of the room, much more satisfactory performance is obtained than with duct systems installed in an old building, where many compromises must be effected to get distribution of cold air.

Planning for Community Disaster Administration

By Charles V. Wynne*

When disaster struck our 425-bed hospital, in a town of 100,000 people, nature precipitated us into solving some of the problems that occurred.

On Thursday, August 18, 1955, Waterbury, Conn., was host to its favorite daughter, Rosalind Russell, who opened her world premiere of "The Girl Rush" that evening.

It had been raining for several days. On this festive day the rain turned into a deluge. Little did the community realize that soon after the festivities were over and the revellers had gone home, the city would face a disaster.

At our hospital our night supervisor went to close one of the casement windows on the east side of the building. She noticed Watertown Avenue was rising—she didn't know why. She went to look again because she knew this window was a little bit loose, and Water-

*Administrator, Waterbury (Conn.) Hospital.

town Avenue seemed a little bit higher. She didn't realize it was water, not the street, that she saw.

The police notified her that something was happening, and she called me at 4 a.m. to say that the Naugatuck, a generally shallow stream which flows through the western center of town, was rising and heavy rains were causing damage to some of the dams at the north end of the valley.

A few minutes later the factory whistles and sirens warned people of imminent disaster.

The hospital is situated on a pleasant rise, as most hospitals are in the mill towns in New England, about 80 feet above and overlooking the river and the entire town. At daybreak we could see, many miles up the valley, a boiling stream of ever-rising water which meant disaster.

I immediately went to the hospital and got hold of the chief of staff, the health officer, the acting director of surgery (our director of surgery was away on vacation), the director of medicine, and the director of nurses. As we sat down and discussed the matter, we put our disaster plan into effect.

All hospitals are supposed to have a disaster plan. Many of them are on paper; many of them are in the minds of individuals, but most hospital administrative personnel know what to do in case of disaster. When we put our disaster plan into effect, we acted as follows:

We provided four teams in the emergency room to handle any case that would arrive for treatment, detention, or discharge. Within an hour we had three such teams in action. Each team consisted of a doctor, a nurse, and an orderly.

This group then consulted a prepared diagram of our emergency room area and adjacent spaces, and assigned personnel to the stations we felt needed to be set up.

Two clerks were assigned to the physician who was given the responsibility of receiving and sorting the patients as they came in. This sorting team elicited and recorded the necessary information from the patient. The physician then routed the patient to the proper treatment team for care.

These teams were designated by the chief of staff to care for exposure and resuscitation, surgical fractures, and pediatrics. Those are the cases which first came to us.

An area was established adjacent to the emergency room for children who became separated from their parents. We established another area for adult patients, so that after treatment they could be cared for until they could be discharged to the various evacuee shelters set up by civil defense.

As administrator, I functioned from the information desk, from which all incoming communications were screened and channeled to proper sources. The chief of staff was given by me the responsibility and authority to carry out all the clinical functions of the hospital, the assignment of physicians, the methods of treatment, the evaluation and disposal of patients in the hospital at the time, those to be admitted, and so forth. Many of his responsibilities he delegated to the chiefs of the various clinical services.

The house physicians were pressed into service. Those who could not get to the hospital reported to our sister hospital across the river, on the other side of town. One of the 14 physicians was sent out to each nursing division. They did a splendid job in caring for the great influx of patients.

The hospital was closed to all visitors except those with immediate relatives on the seriously ill list, and they were allowed to visit for only five minutes.

The flood patients' names and addresses were obtained, and a list of them was compiled and maintained. Inquiries about them were channeled to the information center. Most of the patients from the hardest-hit section of our community were of Lithuanian extraction, and many spoke or understood little English. Fortunately a physician and one of the record clerks spoke and understood Lithuanian.

The first casualties to arrive at the hospital were a group of National Guardsmen, who in attempting to get to their headquarters in their truck had become marooned halfway down the river. We had a trial run with these men, who actually were not seriously hurt.

Speakers in the panel discussion on "Operating Room Nurses Prepare to Meet Community Disaster," given at the third national conference, Association of Operating Room Nurses, held in Boston January 30 through February 1, are shown above (l. to r.): Charles V. Wynne, administrator, Waterbury (Conn.) Hospital; Sister Mary Coronatus, R.N., formerly assistant operating room supervisor, St. Vincent Hospital, Worcester, Mass., and now operating room supervisor, Providence Hospital, Holyoke, Mass.; Mary A. Maher, director, University of Massachusetts School of Nursing, Amherst, Mass., moderator; Albert Murphy, M.D., Boston City Hospital, and George R. Dunlop, M.D., Memorial Hospital, Worcester, Mass.

Our experience with them served to point up a few minor defects in our system.

For example, the guardsmen wandered into the hospital through our many entrances and were not seen immediately by hospital personnel. We then closed all the entrances except the main entrance and the emergency entrance. We also placed volunteer personnel at strategic locations to control the flow of people and supplies through the hospital.

CITY PLACED UNDER CD

Early Friday morning we learned that the city had been placed under the authority of the civil defense organization. We then placed the hospital's two ambulances at the disposal of the organization, and they made trips back and forth from the centers, on our side of the river.

The task of calling key hospital personnel was begun. The hospital pharmacist, who lived across the swollen river, was not able to come to report, but we were able to get one of his assistants, who was convalescing in the hospital.

The purchasing agent was brought into the hospital and made ready the central storeroom for the procurement of the necessary supply items. The hospital central sterile supply department was alerted, as were the x-ray, laboratory, and surgical departments. Other hospital personnel responded, and most of them were able to get to the hospital. One went 65 miles down to New Haven and then back up to Waterbury, because it was the only way he could cross the river.

It was inspiring to see how our volunteer personnel offered their services and their vehicles—many without being called. They were assigned to deliver supplies, control entrances, care for children, and serve food. The Hospital Aid Society kept its snack bar open.

The director of nursing followed her disaster operating procedures by assigning an assistant director of nurses to procure and assign all nursing personnel to care for the patients. She also directed the acquisition of supplies and drugs to this central office for the nursing divisions. The activities of the nursing service were smoothly and efficiently conducted as a result of these procedures.

The dietary department met the emergency by resorting to cold food menus, planned for just such an occasion. They managed to serve all the meals on time. Throughout the first day of the emergency, for example, our suppliers sent us stuff that we didn't ask for but they knew that we needed. An ice cream corporation in New Haven sent us two 1,500-gallon stainless steel trucks full of pure water because the officials knew when they heard about the flood that our water would be contaminated.

ELECTRICAL SERVICE

Electrical service of the hospital was cut off. We cut in our own standby generators, one of which was given to us by the telephone company. We were always going to fix this generator, just as administrators are always going to get the instruments the O.R. supervisor asks for, or they're always going to fix the operating room table, or the conductive linoleum in the corridor, but we didn't have the cable and had to have it flown in by helicopter. Within two hours we had it hooked

up to our main bus bars and ready to turn on the lights —whereupon the city utilities turned them on for us.

At the request of civil defense officials the hospital morgue was utilized for the detention of flood victims pending identification. These are things that you ordinarily don't think that a hospital would be asked to do. The local Bureau of Missing Persons acted as a central information center for reporting and identifying missing persons. This central office issued passes to relatives of missing persons to enable them to come to the hospital to see if we had their loved ones. Authorized persons were taken to view the victims with a sympathetic and understanding physician or member of the hospital administrative staff.

The hospital was not taxed by large groups of hysterical friends and relatives, and the identification of victims was done in an efficient and dignified manner.

Our social service department was very active throughout the emergency, distributing clothes, reuniting children with their parents, and so forth. It was indeed fortunate that they were all united and we didn't lose any. Several children who were not able to give their names were identified by the hospital's dental intern by the fillings in their teeth done by him at the outpatient department a few days before.

Toward the end of the first day hospital personnel and physicians had to be ordered off duty to rest so that their replacements could take over. Thus we were able to maintain a continuous organization of well-rested personnel ready for any contingency.

We were designated as a supply center and were able to send supplies to the evacuation centers, such as Achromycin, barbiturates, aspirin, alcohol, Zephiran, and antibiotics, and also cotton, gauze, sponges, paper goods, soap, disinfectants, diapers, linens, baby formulas, and many other items. We were able to meet the needs because our hospital maintains a high level of inventory for just such contingencies.

The trouble nurses had in getting back and forth across the barricades set up reminded me of days in combat areas, when an unanswered challenge by a guard resulted in a bullet whistling over your head. We'd heard that martial law had been established, but it hadn't. We couldn't seem to get the proper passes to get nurses and other personnel back and forth; so I wrote out a few myself and they were honored.

On the two days of the emergency we saw the following types of cases:

Exposure and water inhalation
Fractures
Puncture wounds
Multiple contusions and abrasions
Cerebral vascular accidents
Burns and dermatological disturbances due to immersion in water

Hysteria and shock cases in patients who had seen their loved ones and possessions perish in the flood waters.

The manner in which the hospital geared its personnel and facilities was not a result of mere chance. There had long been an awareness in the hospital and in the community of the need for plans and their execution in the event of disaster.

We also drew on the preparedness plans published

after the Perth Amboy disaster in New Jersey, and the Worcester disaster in Massachusetts, and other existing plans. The planning for the alterations to our emergency suite and other areas were made with disaster in mind.

On the basis of our experience we made the following conclusions that may be of help to other hospitals:

- The basic hospital organization should be maintained.
- Continued emphasis should be placed on a need for awareness in civil defense matters.
- The hospital should obtain and maintain its own emergency water supply. It seems like a luxury, but it really isn't.
- The hospital should have complete electrical standby service at all times—not 90 percent.
- All employees and their vehicles, no matter in what capacity they serve, should carry some means of identification. It's simple to go down to the City Hall and get a little blue card that has your name, your picture, and your thumbprint on it.
- A well-stocked supply and drug room is imperative if we are to render the service that our community expects of us.
- A spare set of keys to all locked areas should be placed in one central location, for use only in emergencies.
- One over-all authority should direct and delegate the many responsibilities involved in carrying out a disaster plan.
- All ingoing and outgoing communications should be cleared through a central information area.

We learned that the community looks to us for advice and help. It has been gratifying to note the respect and attention afforded the hospital by our community.

Through good personnel policies, proper orientation, and communication, a hospital can develop a spirit of service that was much in evidence during our trying days.

Supplies and Equipment

By Sister Mary Coronatus, S.P., R.N.*

St. Vincent Hospital, Worcester, Mass., was farthest from the Worcester tornado area, and we had a little more time to organize than did the other hospitals, which bore the brunt of the initial onslaught. They did a tremendous job under incredible difficulties —not only technically, but humanely as well.

Our alert at the hospital was dramatic, if somewhat misleading. Just as the Sisters were leaving the dining hall an excited telephone operator announced: "The whole city of Worcester is on fire!" She had her elements mixed, but the warning was enough to make us all fly to our departments.

Reporting to the surgery, along with the nurses who had been summoned from all quarters, our first thought was "Instruments!" Reasoning that the majority of casualties would involve lacerations, we set about assembling and sterilizing small laceration kits. Without using the few basic operating sets, which we intended to keep in reserve for the more severe injuries, we soon had enough sets ready, including those which ordinarily were available in our accident rooms, to handle 14 to 16 patients.

A predetermined plan existed under which the major operating rooms were to be kept available for major injuries, and we adhered to this plan. It is important in planning to make provisions for the more severe cases, and to leave an operating area and equipment free for the prompt care of these patients.

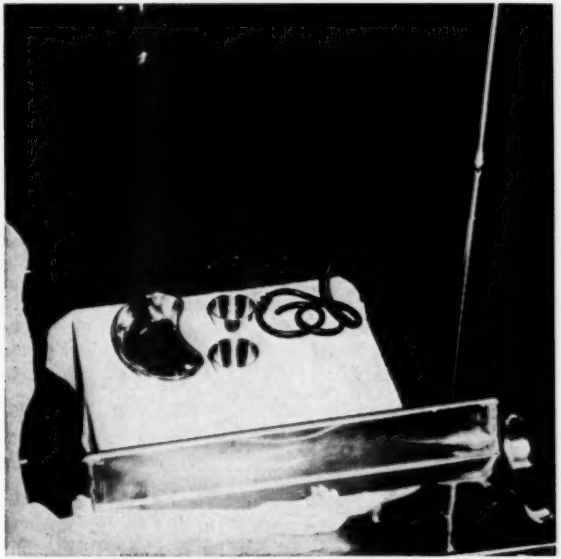
Fortunately, because of the heavy operating sched-

*Operating room supervisor, Providence Hospital, Holyoke, Mass. Formerly assistant operating room supervisor, St. Vincent Hospital, Worcester, Mass.

Each of the 16 operating rooms in the operating room suite is equipped with a spacious, closed cupboard (above). This cupboard is stocked with an ample supply of sterile items. Sufficient stocks are maintained routinely in these cupboards to take care of 30 to 40 operations.

One stock cupboard contains sterile drains, packs, suture packs, and other items necessary for replenishing the room cupboards. Another contains same items in unsterile form. These are ready always for immediate sterilization.

The operating room cupboard is replenished every day from a stock cupboard in the corridor (above). Thus, all goods are being rotated continually, while the general reserve remains constant.



Debridement stand and irrigating set (above) allows for copious irrigations "without the deluge most of us associate with the procedure," the author says

ule we were running, we had on hand an unusually large supply of sterile goods, over and above our daily requirements. Roughly, we had about 200 pairs of gloves, and about 200 packs of sheets, towels, and sponges. Thus we got off to a good start. Meanwhile, the central supply supervisor was getting her sterilizers into action and setting up flow lines of supplies to all operating areas. The control of supplies is a most important factor in the handling of a large number of injured persons.

Suture materials were our next concern. Again, we had ahead a good supply of cotton, silk, and dermal, ready for use. To sterilize these was a matter of minutes. The commercially prepared sutures with atraumatic needles we kept for necessary plastic surgery.

The resterilization of instruments presented a problem, because at that time we did not have any high-speed sterilizers. In any event, these would not be available in any improvised accident rooms, and the problem is one that must be planned for in any disaster program.

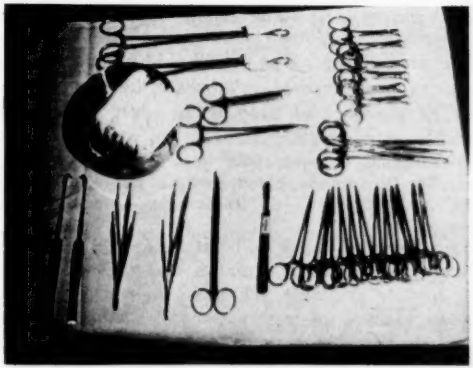
In our case, as the injured persons kept streaming in, we set up an improvised accident ward in our cafeteria. We resorted to chemical disinfection with Zephiran after the instruments had been washed thoroughly in a soapy solution and rinsed. To accomplish this, we merely placed sets of basins at likely spots and assigned our less experienced operating room students to the task. Thus the doctors were kept supplied with instruments that were at least basically clean. Each doctor was also assigned a nurse as a helper.

From every experience we gain knowledge, and I should say the most practical lessons from our experience would be:

1. The necessity of controlling supplies in the operating areas. For instance: How are the supplies to be ordered? Who is to receive and dispense them?

Obviously, the first thought would be a sterile stock

Instruments are available from the sterile instrument cabinet. All types of special instruments are included—wrapped and plainly labeled and all sterile.



Instruments are put up in basic sets, which are designated as "major," "minor," and "baby" sets. The "baby" set (above) is so called because of the small instruments which are included.

table in each operating room, in charge of an experienced sterile nurse with an intelligent and unsterile assistant. The sterile nurse sees what is needed, the assistant tends to ordering and receiving it.

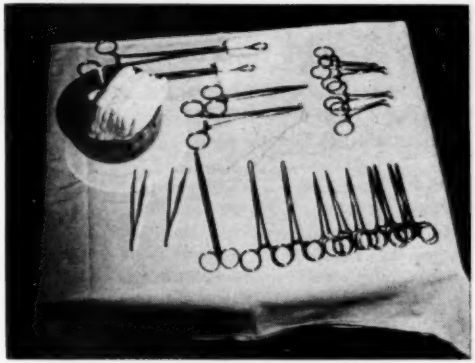
2. The necessity of planning for the placement of personnel and the assignment of specific tasks, such as: Who is to assist the doctor? Who is to clean and sterlize used instruments? Who is to care for the patient before and after the operating procedure, so that there is little loss of time between patients?

3. The necessity of having sterile instruments in sets and ready at all times, or, at least, having them in such form that they can be quickly assembled into minor surgery kits.

As a result of our experience, we now keep all instruments in sterile kits, and so arranged that the larger ones can be rapidly reassembled into a number of smaller sets.

4. The necessity for having on hand an ample stock of operating supplies, either sterile, or, more practically, in a form ready for rapid sterilization.

The "baby" set is easily broken down into a laceration set (below). These two assemblies are duplicated in the accident rooms, so that 12 to 15 instrument sets are always ready for use.



Such a stock should include: gowns, gloves, drapes, towels, Vaseline strips, packs, and drains. The wisdom of this was evident at the time of the tornado, because we had enough supplies left to carry on the next day's operating schedule.

It is not practical to keep a huge reserve of supplies waiting for a major disaster to occur. It would be sufficient to have such a reserve ready for sterilization. Prepackaged sponges and other items are a good investment and save priceless time in an emergency.

Another time-saver is a suture pack. This is merely a set of needles threaded with suitable lengths of silk, nylon, cotton, or dermal. These packs save the surgeon's time, are economical, and can be used to conserve the more expensive atraumatic sutures for special plastic surgery. We routinely keep on hand about three dozen of these packs. If there are a number of small lacerations to be treated, these packs may be divided quickly with a sterile scissors.

5. The necessity for providing for burns. I suggest a mobile burn cart, loaded with supplies of large dressings, Vaseline strips, and elastic bandages to use for pressure dressings.

Of course, if the burns are treated by the wet dressing or exposure method, other materials are indicated.

6. The necessity of keeping an alert corps in the central supply department, with an open channel of communication between this area and the operating rooms. By this means, blood, plasma, IV solutions, syringes, and all kinds of items can be sent quickly where needed.

Planning for possible major disaster is a "must" for all hospitals. Adequate supplies and necessary equipment must be available. Whatever the method of wrapping or storage of reserve supplies, the important thing is to have the articles ready for immediate sterilization.

Having huge stocks of operating items is not enough. These stocks should be under the control of an experienced person, who knows the predetermined plan of action, and who is able to route them rapidly to areas needing them. The central supply room is a key area during a disaster.

Management of Trauma

George R. Dunlop, M.D.*

A disaster can strike any community at any time. I think disasters have several things in common.

First, you're not usually prepared for them. They may descend on you without warning, and a matter of great importance is the initial alerting of the hospitals. I think if hospital personnel had only a half-hour's notice they could do a tremendous job, because they're used to moving in a hurry. But your first warning may be simply the admission of perhaps 100 casualties, with a lot of your staff and help in other parts of the town.

I'm not going to discuss what might be done in other parts of the hospital, because we are concerned primarily with the operating room floor. I think we should compare a busy operating day with a disaster. All operating room supervisors would know exactly what to do with a busy operating schedule, I'm sure. But in dealing with a disaster certain things are added to that day that you normally wouldn't expect.

The first is *confusion*. You may say, "We have confusion every day where I work." We do, too. But I'm referring to confusion compounding confusion.

The casualty victim who's brought into the hospital doesn't get up to the operating room floor as promptly as you'd like to have him. First of all, he must be transported to the hospital and identified. Often such victims are unable to answer questions, and you have no idea who they are.

They may be waylaid by the immediate family or relatives. Many patients in the Worcester tornado were women, because the men were on their way home when the tornado struck. So there were husbands looking for injured wives, and at times there was an element of hysteria in their eagerness to find their missing loved ones.

Then these patients must be *screened for injuries*. As you come into the outpatient department, where normally there's a certain amount of order, you see patients lying on stretchers, on the floor, on the tables, on the desks, and under tables. Those who can stand, are waiting. The heat is terrific, because too many people have crowded into an area which is too small to accommodate them.

*Attending surgeon, Memorial Hospital, Worcester, Mass., and assistant clinical professor of surgery, Tufts Medical School, Boston.

As you look around, many situations are evident. Some patients are in shock or unconscious; others have multiple injuries. I remember one case with an extruded eyeball, an obviously fractured femur, a probably fractured pelvis, and large soft tissue wounds, in shock.

Should you call the ophthalmologist, an orthopedic man, or a general surgeon? You can't get any of them, of course—they're all busy. But what that patient needs right away is intravenous therapy, and here's where the operating room supervisor is involved.

We all have trouble occasionally with intravenous therapy. We all have had the problem of trying to get needles in patients with shock and collapsed veins, but this problem is compounded with a disaster. Sometimes at the scene of disaster a needle may be inserted into the vein, and then as the patient is transported to the hospital the needle comes out.

The intravenous problem is more important than identifying the patient or washing the dirt off his wounds. You can't do any surgery until the patient's circulation has been stabilized.

Some of these patients will be rapidly screened and sent to the operating room floor. You probably will see many patients with needles in their arms, but very few needles are ever in the veins.

I've had the experience of trying to get a needle into the vein of a shocked patient during the first few minutes of a disaster, and I remember a layman who'd never seen a scalpel in her life, holding a flashlight. The only thing available was a scalpel blade with no handle. I couldn't get the vein delivered. A few minutes later, on the operating room floor, we had no trouble at all in slipping a cannula or polyethylene tube into her veins, with the proper light and equipment.

One of the great differences that you will face with a disaster is that you will have to do many more cutdowns. Ideally, cutdowns should be done on a lower floor. If a shock room has been set up, a load can be taken off the operating room, but not all of it. Many times the fluids will run out, or there is a need to get into another vein for a blood transfusion.

Cutdowns are of vital importance. I think most of our cutdown sets have too many instruments. Some sets contain enough instruments for a laparotomy. Frankly, every surgeon would give you a different list of instruments for a cutdown set, but I think there's nothing better than a couple of little vein retractors, an aneurysm needle, and a Metzenbaum scissors, and a knife. You can do practically anything with a vein with those four instruments.

Many instruments may be used up unnecessarily if you are not prepared for cutdowns in shock patients. That has been a consideration in every disaster that I've had anything to do with. Others have told me that they have had the same problem.

Before the patients are cleaned up, before they are anesthetized, before they are operated on, the circulation must be supported. This is always more difficult in disasters than in routine civilian surgery.

The next thing that characterizes a disaster is *dirt*. I think it has a shocking effect on those who spend most of their lives in an operating room and are used to seeing patients come up well prepared. I'm often

amused at the horror expressed by a good operating room nurse if she finds one or two hairs on the shaved abdominal wall. The floor is immediately called and asked, "Who checked that prep?"

With that background, if you are confronted with a large number of patients covered with grease and dirt, the sight may have a temporarily paralyzing effect if preparations have not been made in advance.

The most seriously injured patients reach the operating room floor. I'll describe one. This man saw the wind coming at a distance and called to his son to go upstairs and close the window. The child ran upstairs, just as the tornado hit the house. It took the roof off and killed the son.

As the father was bending down trying to get a carpet adjusted so that he could close the front door, the tornado sucked him out through that screen, and the bottom of an ornament gouged all the soft tissue off his back, including some bone, and then rolled him for 400 or 500 yards down the field. He had a tremendous soft tissue wound and of course was covered from head to foot with dirt.

There is not always time, with patients who are bleeding or in shock, to clean them up on another floor. Some of these patients are desperately injured, and need supportive therapy quickly.

If injuries are of a minor nature, stations in other parts of the hospital may be designated for their care. With such a plan you're going to get the worst injuries on the operating room floor.

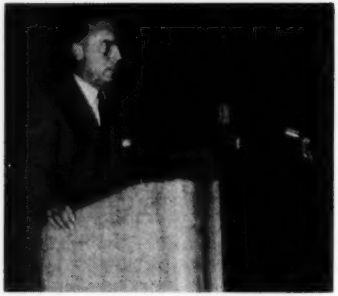
Preparing casualty patients requires a lot of soap, gauze, and brushes. If you're not prepared, the only type of supplies available to your operating room staff are sterile supplies. They will open their shiny cans of sterile gauze and do a fine job on the first patient. But they're using valuable supplies that you are going to need desperately later on. Prepare for the cleaning up of the grimy patient before any surgery can be instituted.

All this advice may sound elementary, but actually it deserves emphasis. The preparation of one extremity in a civilian accident is quite different from preparing a person with large soft tissue wounds who has been rolled in the field or has been caught in an exploding building, or injured in any of the many disasters that can hit our communities.

One final thing is important: *Anesthesia.* No matter how large an anesthesia department you have, it will be immobilized with the first six, eight, or 10 desperately injured people. Some cases can be handled with local anesthesia, and you should be prepared to give it.

I've tried to emphasize the things that you're not apt to see unless a disaster hits you. They may seem a little trivial, but they become increasingly important when these patients are wheeled off the elevator.

If you have an anesthesia recovery room, it's an ideal place to scrub up and screen patients. They've already been screened once, but when they get to the operating floor they deserve another evaluation.



Treatment of Burns

By Albert Murphy, M.D.*

The problem of burns is really more a philosophical and a psychological one than a practical one. When we start thinking in terms of atomic disasters, we have to think in large philosophical terms of what we can do best for the most people with the least equipment and the fewest personnel.

It was H. G. Wells who said that human history is a race between education and catastrophe. Nursing education and medical education have been going on at a very rapid pace, but at the same time catastrophes have been increasing in civilian, and, potentially, in military life. An organized team can make the difference as to whether these catastrophes are reversible or irreversible.

At the present time the medical profession has to act on the premise of doing the best for the most, as I say, with the least equipment and the fewest personnel. We're going to have to make certain intelligent compromises between what we consider ideal burn treatment for the few people who might come, and the hundreds or even thousands whom we might receive in a disaster.

Nurses have been doing more and more. They now do anesthesia and give intravenous fluids, and in times of disaster we expect that they would do much more of this. In addition, they probably would do, under supervision, the debridement of wounds and other minor surgical procedures.

The level of patient care which we would expect to give in the ordinary hospital under ordinary circumstances, is not going to be the same in disasters.

*Dr. Murphy, a member of the staff at Boston City Hospital, helped care for victims of the Coconut Grove disaster in Boston several years ago.

Philosophically, again, we shouldn't think of such things as plastic surgery, prevention, or the curing of infection. When a disaster comes we must take care of the important things—the supportive therapy, the intravenous therapy. Plastic surgery and even the local care of wounds can all be taken care of later. We have to think in terms of the mass of people rather than the individual.

The problem of mass casualty burn care may seem almost overwhelming, but I think that we can make a realistic approach to it if we keep in mind the philosophical facts which I've tried to make a little clearer.

So, starting with the ideal burn treatment, we will then see what has to be done to modify it, depending upon the number of people who may come to you in any emergency.

As Dr. Dunlop said, in any major catastrophe the supportive therapy takes precedence over any local therapy. There's no point in making a good-looking corpse, and that's about all you're doing if you're spending time worrying about debriding wounds and taking care of plastic procedures. In burn therapy the same thing holds; supportive therapy takes precedence. Of course, supportive therapy in burns is a little bit different than in other types of trauma, because the fluid that is lost is a different type of fluid. It is largely plasma without red cells. Therefore, in treating burn shock, although at the present time we use blood rather than plasma because of the danger of hepatitis, in an emergency certainly we would not hesitate to use plasma, plasma expanders, blood albumin, or whatever fluid was immediately available. Getting the needle into the veins is the most important thing we have to do in the badly injured patient.

All of us who have worked in large municipal hospitals know what to do with very little equipment, and it is much better to save your sterile goods and surgical instruments for the operating room. In the accident floor and in shock rooms, very minimal amounts of surgical kits should be available.

The fluids that have to be replaced are colloids, electrolytes, and just fluid. At the present time a great deal of work is being done with plasma expanders. They are extremely valuable in large disasters, because they are easily stored in small volumes and can re-establish the satisfactory circulating blood volume of the patient with minimal effort. At the present time, to be sure, there are some disadvantages. Some expanders, perhaps (over long periods), cause liver damage, if large amounts are used.

Philosophically, again, we are trying to get a large number of people over an emergency. We're not worried about whether they might get hepatitis six or eight weeks or three or six months later which might have to be treated. We are treating them at the moment for what is most important. If we don't get them better now, we're not going to have to worry about their hepatitis later.

For that reason these various plasma expanders are of very great value, because you will not be able to store adequate blood and plasma, to take care of any large number of casualties.

For electrolytes, we like to use some type of solution such as lactated Ringer's solution or Hartman's solu-

tion, rather than the ordinary solutions that are stocked in most places. They alkalinize the blood and give us as better physiologic combination of electrolytes than the usual sodium chloride or sugar. Then, there is the glucose and water to make up the insensible loss that is used up every day through the lungs and urine.

There is a very simple method of determining how much fluid is necessary. It is based completely on the area of burn which is encountered. It is important to know this, because in any large catastrophe not only are there many people injured, but some doctors and nurses are going to be injured, so that there will not only be a large number of injured, but less people to take care of them.

Thirty or 40 nurses, under the jurisdiction of one doctor, may be called upon to decide how much fluid a given patient needs.

The area of the body that is burned can be very simply divided by the so-called "Rule of 9." Consider all parts of the body as multiples of 9—the head is 9, each arm is 9, each leg is 18, and the trunk is 36. You will then quickly have an idea of what area of the body is burned. Then remember that for every percent of the body that is burned (second or third degree) 75cc. of colloid and 75 cc. of electrolyte should be given.

In other words, a 20 percent burn of the body would require 1500 cc. of colloid—which includes blood, plasma, or plasma expander—and 1500 cc. of electrolyte. In addition, all patients should get 1500-2000 cc. of glucose in water for their daily requirements. Half of that total should be given within eight hours and the other half in the succeeding 16 hours of the 24. In the second 24 hours, half of the first day's amount is given. That will give you some idea of the magnitude of the amount of fluid that is necessary. It means a large stockpiling.

For patients who are well enough to take fluid orally, there is a very simple 1-2-3 formula:

1 gallon of water has put into it

2 tablespoons of soda bicarbonate and

3 tablespoons of salt.

One, two, three—we try to make things simple and by formula. This fluid can be given to the patients who are well enough to take things themselves, and we hope there will be a fair number.

Other supportive measures are the relief of pain; antibiotics; antitetanus serum, and possibly tracheotomy.

IMPORTANT WARNING

There is one important warning: People in shock do not take up things injected under their skin. If you give them a quarter of morphia and they seem to still be restless, there's a great tendency to want to repeat the dose. Tragedy may result when people are given large amounts of sedation subcutaneously while they're in shock. When they resume a good circulation and take up huge amounts of previously unused and unmetabolized sedative or analgesic, they are then in serious condition. So be very careful not to oversedate patients who seem not to be responding while they're in shock.

Antibiotics can be given at any time. If they're not available, I think they are of secondary importance. Most people today will receive antitetanus toxoid, and we won't worry about booster shots until a later date.

Tracheotomy is sometimes necessary in burned patients—usually the most severely burned—but it can take place later on. The local treatment of burns is relatively unimportant in a mass catastrophe.

I'd like to quote two lines:

"The best application to burns is decided only by what substance gives the most perfect protection and comfort at first, and to be longest retained on the part without occasioning irritation or interruption of the proper efforts of nature."

That wasn't written last year—it was written in 1820 by a Dr. Anderson in Scotland. We don't know any more about the local treatment of burns today than we did then. It took us until 1947 to find out about the exposure treatment of burns. The pendulum has swung back, however, and it's not quite as important today as it was in 1947.

In a burn catastrophe we're not going to be worried about whether we're using boric strips or Vaseline strips or dry strips—we're going to use whatever we have available. As far as stockpiling is concerned, we would like to have fine mesh gauze, whether it's plain dry, or whether it's impregnated with Vaseline or some locally prepared boric or other unmedicated, Vaseline-like substance. It is very difficult to store much impregnated gauze. It's difficult to sterilize and keep sterile and thus not very practical. At the present time the best thinking is that fine mesh dry dressing, with pressure on circumferential areas is the best method of treatment.

If a perineum is involved the victim should be treated by the dry method; if only one surface is involved, and the victim can stay on the unburned surface, that method should be used. Whenever possible, the exposure method with no dressings at all, is of some value.

One difficulty with that method is that people are quite uncomfortable, and may try to cover their burns. If they do, they will defeat the purpose. So we do have to keep them comfortable.

MASS TREATMENT OF BURNS

How, then, are we going to change this and translate this into our treatment in the mass catastrophes? Four or five burns will upset a large hospital. What would happen in a simulated attack on Boston with its 800,000 population, or two and a half million, if we consider greater Boston?

It is felt that one percent of the population would receive severe burns. That would require 24,000 miles of bandage, 4,000 liters of electrolyte, 300,000 liters of plasma, and 700,000 liters of blood, at a cost of $4,000,000 for the first day.

It gives you some idea of the magnitude of the thinking one has to go through, in terms of mass casualties. What then would the hospital do? Here are the four major types of burns as we think they should be classified; and how they should be handled:

First are the so-called *self-care* burns. The patients

would be expected to take care of themselves. In all disasters, certain people who in the ideal community would have very elite medical care, will be taking care of themselves. There will be other severely, overwhelmingly injured or burned patients who will have to forego any treatment in order to save the two big categories, the moderately and the severely burned or injured. In the self-care group will be burns up to 15 percent—the majority of burns, even in an atomic catastrophe. We will give them the oral 1-2-3 solution. They will not need parenteral fluids. They will be given an oral broad-spectrum antibiotic; they will have exposure treatment of their burns, and any complications will be taken care of later.

Those people will be farmed out to any place available. They probably won't be under cover or in tents; they'll be sent home. At the present time it is felt (on the basis of Army thinking) that a container can be made up which will contain the makings of their oral fluids and antibiotics, and they need nothing for their dressings.

Second, the *moderately severe* burns (15-20 percent). This group may also include less severely burned patients with evidence of inhalation in addition. They will need temporary oral fluids until they can be brought back to a first priority hospital in which they can get their intravenous fluids. In a municipal institution they probably will be kept on the accident floor before they're brought to the operating room, with oral therapy if they're able to take it, and intravenous therapy only when absolutely necessary.

The third category includes *severe burns*, treatment of which will tax us very severely. Victims will need aggressive replacement therapy which will be started on the accident floor and be continued in the operating room. They are the ones who will need the most done for them.

We hope that a one-piece dressing will be made up which will go over extremities and which can be applied with pressure. We think that debridement should not be carried out, for anything in that nature which is time-consuming and requires instruments should be put off until a later time. An occlusive dressing is sufficient.

The last category includes the *overwhelming burns*. Under ideal conditions we save less than 50 percent of them anyway. They will have a very low priority. Nothing will be done for them except to make them comfortable, because, again, we're thinking in terms of salvaging the greatest number with the limited personnel that we will have available.

When these people then are brought to the operating room, there will be, largely, relatively untrained personnel. Many doctors who have several hospitals will have to decide where they're going, and one doctor will be taking care of many different people. Dentists, trained technicians, and operating room nurses will have a high priority.

Nurses undoubtedly will be giving parenteral therapy, anesthesia, and even some debridement if it is necessary or deemed advisable by the doctor. But the doctors will be sorting and determining priority, and will be doing very little of the actual work. Much of it

will be done by the highly trained operating room and accident room supervisor and nurse.

In all these large disasters, it's a matter of philosophy of treating these people in which one has got to do the greatest amount for the greatest number of people, with very little help, and as little material as you can use. The doctors have to sort the patients to determine their priority, and operating room nurses will have to do the great bulk of the actual practical treatment of these cases.

Q. Should an attempt be made to clean burned areas if they are dirty?

A. In mass casualties I think there is no question that no attempt should be made to mechanically cleanse the burns. An occlusive dressing with pressure should be used in circumferential burns. Exposure alone can be used in burns of the face or perineum, or burns involving only one surface.

Q. How do you propose to train nurses to do debridements and the like, when now they're not even allowed to give an aspirin without a doctor's orders?

A. It seems to me that operating room and accident room nurses could be given a postgraduate course in the major problems of debriding wounds. They would do such work under supervision, of course. Doctors would have to travel from place to place during the disaster, saying just to debride that obviously gangrenous or dead area, and so forth. Certainly, at the present time, an appreciable number of doctors allow their nurses to close at least part of the incision for them. No doubt some medicolegal implications are involved, but the practice has been followed for a good many years.

Q. In a major disaster, is there a class of injured that would be overlooked as hopeless, so that precious time can be devoted to those that can be saved?

A. The ones in the fourth group I mentioned—with over 50 percent of the body burned—would have low priority. Priorities, as far as the armed services are concerned, are graded thus: (1) massive hemorrhage; (2) chest wounds; (3) abdominal wounds; (4) burns and crush injuries; (5) head and spine injuries.

Supervisor Must Take Lead In Good Interpersonal Relationships

• Developing good interpersonal relationships in a department naturally starts with the department head. In the operating room this person, in most instances, is the O. R. supervisor.

A factor which contributes largely toward the development of a desirable relationship between people is early home training. We start off with important assets if we have had the good fortune to be raised in a home in which courtesy and a congenial atmosphere were the rule and not the exception.

Early training in the ability to get along with others is invaluable and far-reaching. The foundations for better relations are made from good intentions and an insight into self and the feelings of others.

Interpersonal relations or relations with the members of her staff should be of vital importance to the O. R. supervisor. It is her responsibility to establish good morale so that each one has the feeling of belonging and a desire to work effectively with others. She is concerned with the development of loyalty, cooperation, and a common purpose, or the basic background for effective working conditions.

The operating room supervisor first finds need for self-examination. Her self-interests color her behavior, and she should, therefore, make a careful study of these factors. To gain respect from others she must have self-respect. This is manifested in her speech, the tone of her voice, her personal appearance, poise, friendliness, and the presence of a quiet inner control.

She should have a sense of fairness, be willing to listen, be approachable and informal to the degree of putting others at ease. Human warmth, governed by a skillful head, is also an asset.

SHOULD JOIN GROUP

The O. R. supervisor needs to enter in and be a member of the group. Her appearance at the coffee break should

be usual rather than unusual. To have her walk into a working area should be a matter of course and not one of concern to the worker. This gives her the opportunity to make mental notes, compliment the worker and observe the quality of performance.

Good morale comes from friendliness and appreciation. When criticisms become necessary it works best to compliment, then criticize and compliment again. By this method the worker absorbs the criticism, but is left with a feeling that all is not wrong.

Orders given in the form of a question are received much more readily than authoritative commands. If the operating room supervisor shows understanding and directs others properly, they also develop understanding.

Each member of the staff should be permitted and encouraged to share in making improvements, help in problem-solving, and take an active in terest in new developments in the department. For an employee who works in a position of little status, the feeling of belonging and of possessing worth as a worker is most essential.

The supervisor occupies a position of central importance in developing the social status within which her staff works.

R. N. In-Service Program For O. R. Graduate Nurses

● In-service programs for graduate nurses in the operating room are not only stimulating but helpful in promoting personal growth. Some of the advantages are improved staff relations, communication, and understanding. Not only does the patient benefit, but the nurse who takes part is encouraged to do better planning, make constructive changes, and in general improve the quality of nursing care.

LEARN WHILE AT WORK

In-service programs are often requested by nurses who realize the importance of personal growth in keeping up with the advances in medicine. This type of education provides a process for learning while at work. Occasionally nurses make the mistake of thinking the program must be complex and time-consuming, not realizing that many simple but important processes can be part of in-service education. No one can deny the time factor, but somehow things get done if the desire is present.

The plan for an in-service program may be extensive or limited, depending largely upon the size of the staff and the physical setup of the department. New methods and plans found in large hospitals are not always ap-

plicable in small ones, and in the latter it may be more effective to have several departments working together. Small operating room units, however, should not overlook the opportunities in every-day planning. With a variety of methods and procedures involved in preparation for surgical operations, there is need for constant study. Even small changes can be meaningful.

It is the duty of the supervisor to encourage advancement and education. It will be necessary to arrange for frequent discussions between staff members, and it is very important to develop good staff relations. Quite often the first project suggested by an operating group, involves a change —either adopting a new method or simplifying and revising an old one. It is necessary to anticipate whether or not there is a readiness for change. Usually people wish to change when they are not satisfied with the old way of doing things. If staff members are brought in direct contact with each other, their needs can be recognized and discussed and can become a challenging goal for improvement. The supervisor must keep in mind that one change leads to another, and that she is responsible for staff performance, guidance and coordination.

In the beginning it is better to put programming on a small scale, rather than to chance the failure of an elaborate plan. Whatever the interest, it should be encouraged, for there must be a desire to learn. Start by calling a meeting of the graduate staff for the purpose of developing a desire for an in-service program. After the aims and purpose of the program have been discussed, a committee may be appointed to formulate a plan of action.

QUESTIONNAIRE HELPFUL

A questionnaire which covers topics and plans to be considered is helpful. From the questionnaire the group then can select a reasonable goal, which may be to solve a problem, revise a procedure, or arrange for lectures or any other projects of common interest. Emphasis again is placed on selecting a fairly simple project for the initial program. If it is to change a procedure, an analysis of the situation is made, and the group studies the "old way" and the "new way." The study determines why the change is necessary and how it is to be accomplished.

Suggested plan for action:

Goal: To revise a procedure

Steps toward goal:

- Establish clear understanding of project
- Include those who are involved
- Anticipate problems
- Focus on main issue
- Review progress from time to time
- Test several methods
- Select procedure best suited to needs
- Delegate members to take action
- Evaluate—test—evaluate
- Make decision
- Install
- Follow through.

Interest develops as progress is made, and it may be necessary to change and enlarge programs. This may be accomplished with demonstrations, new teaching programs, lectures, panel discussions, institutes, workshops, conferences, field trips to hospitals and manufacturing plants, development and simplification of setups, and any number of subjects which will interest the staff.

Orientation of the Nurse in the O. R.

● The help gained from a good orientation program is most valuable. A great deal of time goes into planning the program, but when the new employee arrives, it proves to be time well spent. Provision, if possible, should be made for a full-time staff member to help organize an orientation program. If the plan is good, it rates high in the promotion of job satisfaction. The turnover of personnel becomes less, and the cost to the hospital is decreased.

Time should always be allowed for the orientation of personnel. First impressions are lasting, and nothing is more frustrating than to find oneself in a new setting with no introduction or explanation of the surroundings. The "new" person should be shown the relationship between what she brings to the situation and what is expected of her. Proper introductions to key personnel and to her co-workers are part of the plan to make her feel welcome. A clear understanding of job responsibilities should be established and friendly relations encouraged.

As soon as the "new" person develops a sense of belonging, she will begin to function more effectively. Her interest will grow, and she will contribute to the general growth of the department.

An orientation program which has been planned and organized in advance can supply many tools which will save time and provide a source of information at the disposal of all personnel. Tools vary according to hospitals, but the following are offered as suggestions:

1. The floor plan
2. Hospital diagram
   Location of departments
3. Policy books

General
Departmental

4. Job descriptions
5. Rules and regulations of the department
6. Index to supplies and equipment
7. Bulletin boards
8. Procedure books or manuals

A short, friendly interview with the new employee precedes the actual orientation program. During this interview both parties discuss personal interests or views on subjects irrelevant to the situation. The aim is to establish friendly relations and put the "new" person at ease. Following this, information is given on the operating room personnel—including the number of graduate nurses, students, and ancillary workers, and a brief description of their functions. Schedules for operations and the services covered are explained.

A tour of the department is then in order, and the escort should be qualified to answer questions. The employee is then taken to various departments of the hospital. Proper introductions are made along the way, and the lines of authority are explained. Upon her return to the operating room, the tools of orientation are presented, and sufficient time and a quiet place are provided to permit concentration and study.

The "new" nurse should be encouraged to take an active part in the educational program. She may bring new ideas and share experiences valuable to others.

The small courtesies, such as having someone accompany her to the dining room for several meals, should not be overlooked. She should not be forgotten when it is time for the coffee break. Consideration and thoughtfulness, no matter how busy the day, have much to do with happiness on the job.

In conclusion, a well-planned, properly used orientation program gives the impression that your department is a good one in which to work. It is also the first step and an important part of in-service education.

Method for Testing Petrolatum Gauze

The official method for testing sterile petrolatum gauze is described in a new monograph* in the 15th revision of *U. S. Pharmacopoeia*.

Absorbent gauze is placed in suitable containers, sterilized in an autoclave at 120° C. in steam atmosphere for 30 minutes. White petrolatum is placed in a beaker and heated to 170° C., as measured by a thermometer inserted into the petrolatum. Temperature is maintained between 165° and 170° C. for two hours.

The petrolatum, at the end of the heating period is covered and permitted to cool to 100° C. Then it is aseptically poured upon the gauze to cover the entire mass. The container is tightly closed immediately.

Petrolatum gauze U.S.P. must meet the sterility test for petrolatum gauze which is included in the chapter on "Sterility Tests" (p. 841). It is advocated that petrolatum gauze U.S.P. be packaged in individual units so that sterility of unit is maintained until package is opened for use.

Extensive bacteriological research documents the published requirements in the official standards. It is recommended that hospitals which make their own petrolatum gauze take cognizance of the processing requirements.

*Petrolatum Gauze Now U.S.P. (pp 304-305) *U. S. Pharmacopoeia*, XV

BOOK REVIEW

Introduction to Operating-Room Technic

By Edna Cornelia Berry, R.N., A.B., and Mary Louise Kohn, A.B., R.N., M.N., Published by The Blakiston Division, McGraw-Hill Book Co., Inc., New York. As an operating room Baedecker, Berry and Kohn's "Introduction to Operating Room Technic" provides comprehensible guidance for the neophyte or student. The illustrations are excellent and the philosophy and behavior patterns outlined by the authors are valuable contributions to the armamentarium of the student of operating room technic. The glossary indigenous to each surgical specialty is helpful as quick orientation for the student.

In their attempt to "keep the material as general as possible," the authors have, however, failed to define fundamentals and basic concepts well enough to allow the reader to construct a sound technic applicable to his own situation. Coupled with this is an inordinate amount of compromise which in specific instances jeopardizes patient safety. The obsolescence of certain technics is perpetuated by mere mention in a work of this scope and is unflattering to the authors as well as an obstacle in the road to safe and intelligent patient care.

In other instances, the attempt at concise brevity introduces potential danger to both patient and personnel as for instance in the description for disposal of instruments and equipment used in septic cases. Here, the desired goal of making this equipment safe for handling *before it is handled* is either hidden or lost in the exigency of space utilization.

The "Introduction to Operating Room Technic" encompasses so many facets of operating room technic, it can serve well as an outline of operating room curriculum if used with critical evaluation and a more careful assimilation of the reference material presented.—**Dorothy W. Errera, R.N.**

Hospital Liable for Damages To Unconscious Patient

The following, which deals with the law of postoperative injuries, is from "Review of Hospital Lawsuits," by Leo T. Parker, a regular monthly feature in HOSPITAL TOPICS.

According to a late higher court decision, a hospital is liable in damages for injuries to an unconscious patient.

For illustration, in Oldis v. Societe Francaise, 279 Pac. (2d) 184, the testimony showed facts as follows: A patient named Oldis went to a hospital for an operation. He was unconscious during the surgery and for a short time thereafter. During the remainder of the period, because of postoperative pain, he received ⅛th grain of morphine sulphate, hypodermically administered, every two hours around the clock—34 injections during the three days following the operation.

Plaintiff's resultant condition during this period was described as groggy, tired, confused mentally, quite confused; at times he blacked out. During this three-day period he was severely ill. Oxygen was administered through a tube in the nose from time to time and intravenous injections were administered to raise the blood pressure. There was a drainage tube inserted into the chest cavity, through the incision in his back and connected to an underwater suction apparatus. At times a rectal tube was inserted. He had a relatively high fever and was injected with doses of penicillin at intervals. He lay helpless, unable to move except when shifted by a nurse. The bed was not cranked up. The first two days he was unable to talk; he just moaned. One morning he told the attending nurse he had a cramp on the right side. He said it bothered him a little but he didn't say it was painful. The nurse examined the area, discovered it was red and blistered and notified two of the doctors. Sometime afterward Oldis learned that he had a severe burn.

Oldis sued the doctors, nurses and the hospital corporation for damages on the theory that the doctrine of res ipsa loquitur was applicable. In holding Oldis entitled to recover $16,000 damages the higher court said:

"The burn was severe of the third degree and located on the right lower quadrant of the abdomen, a little below the belt line. Yet plaintiff (Oldis) did not know he had been burned nor how it happened. There is evidence that morphine dulls the mentality, slows the reactions and cuts down the feeling of pain, makes the patient sleepy and drowsy; repeated doses have a cumulative effect and could prevent a patient from feeling the pain caused by a third-degree burn. These facts brought the doctrine of res ipsa loquitur into play. There is a possibility that the burn may have been caused by the application of a hot pack with a hot water bottle at any time during the three-day period."

At this point it is well to explain that the doctrine of res ipsa loquitur means that the court itself can, from the testimony, decide that the hospital being sued is

liable, without any proof that the injury complained of resulted from negligence of the hospital officials or employees. This situation exists only when the circumstances are such that it is quite apparent that the injury could have been sustained only through negligence of the hospital official or its employees. Generally, of course, no hospital is liable for injuries to patients or visitors or employees unless the testimony proves that such injuries were caused by negligence of the hospital's management or regular employees.

Planning and Managing the Recovery Room

By Eugene D. Rosenfeld, M.D.*

There's a good deal of a difference between the approach to planning a recovery setup in an existing hospital and that to planning one for a new hospital. I've had both experiences.

In the first situation, it is possible to analyze experiences and statistics in the light of the existing program and in the light of hopes and aims. In the second situation, one must guess or project future activities much along the line of what other hospitals of similar capacity have experienced. I think that one encounters a great many more problems in designing a new unit without the background of previous experience.

Where you have an existing hospital, planning a recovery room, it seems to me, should be a joint operation involving the administrator, the architect, and the surgical staff—not the chief of surgery alone. I think one of the biggest mistakes we make in planning is to assume that the chief of a particular department is the only one who has the answers. The entire surgical service, including all the specialties in the hospital, should be consulted—and some of the assistants and adjuncts will have better ideas than the chief.

The final decision, however, on any planning project still must remain with the planning authority, which means the administrator, the consultant, and the architect.

I think that the planning team should include the O. R. supervisor and her staff. I do not believe the O. R. supervisor or O. R. nurses should be in charge of the recovery unit. But certainly the surgical supervisor is a key person in the planning operation, and so are the

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nurses who are going to staff the unit—at least the head nurse should be in on the planning operation.

The central supply supervisor should be consulted, because most, if not all the production of trays, packs, instruments, etc., should take place in the central supply, *not* in the recovery unit. Recovery unit nurses should be free to take care of the patient.

By all means, the anesthesiologist and his group are vitally important in the planning.

One must start, it seems to me, with a breakdown of previous experience. How many operating rooms are in action, and how many are you going to put in action? What type of cases are you doing, and what type of cases are you going to be doing? Are a good portion of your surgical procedures to be majors, or minors? If majors, what kind of majors? How long is your postoperative follow-up and recovery period apt to be in the average case?

Look at the surgical ward. Find out how much time is spent by special duty nurses in taking care of postoperative patients when no postoperative unit exists.

Find out the attitude of the surgeons and the anesthesiologists on what constitutes good postoperative care.

DO NOT go by a rule of thumb. Many articles tell just how many postoperative beds you should have. Probably the best planning booklet on the postoperative recovery room is the one that U. S. Public Health Service issued in 1952. It says that a hospital of 100 beds with two major operating rooms should have three recovery beds. The formula is: a bed for each operating room plus one. In a 200-bed hospital, the formula becomes a bed for each operating room plus two; in a 300-bed hospital, a bed for each operating room plus three.

I don't believe these figures are as valuable today as they were when they were first recorded—for this reason: In our own experience, we planned eight beds for four major operating rooms and three minor operating rooms—but for seven operating rooms, eight beds have proven inadequate. We'd like to have 10. The formula would be revised to provide two beds for each operating room plus two.

PLAN FOR MAXIMUM USAGE

I do not think any formula can be used. One must plan for the maximum usage, the maximum need, the maximum demand—not for an optimum or a minimum or an average. Take into consideration that there will be times when some postoperative patients will spend longer hours, and larger numbers will spend longer hours in the recovery room than on the average. It's the facilities needed on that day that one must plan for to do a competent job with the recovery room.

A recovery room placed at a distance from the operating suite may cause tragedy. In my estimation, a recovery room is part and parcel of the operating suite. It should be as closely integrated physically as possible. In the Long Island Jewish it is part of the same facility. You enter the operating pavilion through a corridor, and the recovery room is off the same corridor. The patient can be taken off the operating table onto the recovery bed, and the bed rolled right into the recovery room.

The distance and the time factor are cut to a mini-

mum, and I think that this of course accounts in part for the excellent clinical results we've had with the recovery room.

In planning for an existing institution, take all these things into consideration and you may find, as Montefiore (New York City) did, for example, that most of its surgery was major surgery, and difficult surgery. Many patients had such major procedures as hemipelvectomies and operations of that type. In that kind of hospital, I think you ought to consider the recovery room as a postoperative group nursing unit, not simply as a recovery room. You need both. You must be prepared to care for the postoperative patient who is having a very stormy course, and take care of him in lieu of special-duty nursing. That's the dual philosophy I think you must bring to postoperative recovery units.

In our experience, the average patient with a minor procedure and a short anesthesia is in the unit for a half hour to an hour, until he has recovered from anesthesia, his vital signs are stabilized, and he is ready to go up to his room.

But the average major surgical patient is in for three to four hours before he is considered ready to go to his room. Not too infrequently we have patients who stay overnight in the recovery room, and we have had patients who have stayed many days. In fact, one of our first major problems at the hospital was a craniotomy on a very young girl who had a spontaneous unexplained cerebral hemorrhage. She was in the recovery room, I believe, about 18 days.

Patients who stay in the recovery room beyond the half-hour or hour period are usually those who have undergone cardiac surgery, central nervous system surgery, chest surgery, and occasionally complicated abdominal surgery, although most of these patients do very well today.

I think this dual use of the recovery unit pays great dividends, particularly when special-duty nurses are so difficult to come by, and when the average special-duty nurse is not well trained for the care of the truly difficult postoperative patient. Getting specially trained nursing personnel who understand the requirements of a postoperative patient is a very vital part of staffing a postoperative group nursing unit. I think one should start months in advance of the actual opening to plan and train the personnel—not just plan the physical facilities.

Planning a recovery unit for a new hospital requires that you anticipate certain requirements. Will the average hospital's experience be yours, or for special reasons because of special programs, will you take on special problems and must you plan, in addition, more space for more activity?

One question that will come up in your planning is whether the recovery room should stay open 24 hours a day, seven days a week.

If you conceive of its function as we do, as a combination recovery and postoperative or group-nursing unit, it *must* stay open 24 hours a day. The postoperative nursing personnel must be available for emergencies that take place after the routine operating schedule

of the day, for the patients who stay overnight, and for the patients who occasionally stay a number of days.

STAFF FOR EIGHT-BED UNIT

For our eight-bed unit we have a staff that consists of a head nurse, two staff R.N.'s, and one aide, for the 8-4 shift. We have one R.N. who is on from 12:30 to 9 p.m.; one who comes on at 4 p.m. and stays on until 12 midnight, and one who comes on at 12 midnight and stays till 8 a.m. So, in all, we have six R.N.'s plus an aide. In addition, we've been fortunate in having a volunteer who is an R.N., who loves the recovery room work and is there four full days a week.

It takes that large a staff for an eight-bed-unit, 24 hours each day. There will be times when there'll be no patients in the recovery room. I think that in staffing the room, it should be made plain that when such a situation exists, the nursing administration and the administration of the hospital will feel free to transfer the recovery room personnel temporarily to other units in the hospital, with the full understanding that they'll return immediately to the recovery room as soon as a patient is there.

I think to try to do it the other way around—to transfer personnel from other units in the hospital to the recovery room—is bad planning, bad personnel administration, and can only result in heartaches.

Even with the kind of management I'm suggesting, you'll find nurses assigned to the recovery room who resist and resent being transferred even temporarily to other units in the hospital.

RECOVERY ROOM LAYOUT

If you look at recovery room layouts in various hospitals, you'll notice that when they were built in existing hospitals, they took the form of the available space. When they are built in newly available space, preferences for layout seem to vary considerably. In my estimation the best form is a sort of horseshoe, with the nurses stationed in the open end of the horseshoe so that they have direct visibility and the least distance to travel to patients' beds.

Recovery units should be open areas. In the Montefiore unit, there was visibility from the nurse's station of all of the beds, but through glass-partitioned cubicles. Montefiore still continues to use this unit, but as a group-nursing unit. Five more beds have been added in an open unit for the immediate postoperative recovery room functions for those who stay for an hour or two.

Our unit is entirely open, divided only by curtaining. We are often asked, "Is this possible? Can you mix the sexes? Can you mix the ages? Can you mix different types of patients in a postoperative recovery room?"

You can, and you do. Most of the patients are not too concerned about who their roommates may be at that particular time. By the time they might get too concerned, they're ready to be transferred back to their own room.

The open unit gives much better control of the patients than you would have with partitioning made entirely of glass.

Most of the units have solved the early problems—one of which was how to place beds in a recovery unit.

We traditionally place beds with the head against a wall. Then we have difficulty because we can't move back behind the bed unless we move it out. Placing beds against a wall also requires that the oxygen and suction equipment, which should be piped in, be placed at a height above five feet so that the back of the bed will not knock it off the wall. Reaching up that high to handle gauges, and so on, is difficult. The gauge ought to be down at a level of about 3'6" or 4', which is the normal height at which most of us can easily work. If you place your outlets at this proper height, the back end of the bed may knock the equipment off the wall or damage it.

We have placed a stainless steel bedside table, containing much of the immediate equipment needed in the care of the patient, between the head of the bed and the wall. That table is about 30" high. The piped suction and oxygen equipment is just above that height and immediately handy.

We have also used specially designed beds—similar to the old "I" beds, which had the same height at the tail end and head end. If you use a standard bed that has a high head end, turn it around—make the head end the tail and the tail end the head—and put the patient's head at the tail end. I think you'll find it'll work much better.

To plan for this use of bed and bedside table, you must leave about 10 feet from the wall for the bed, and about four feet of aisle space beyond that. I think planning this way pays great dividends.

ROUTINES FOLLOWED

Routines should be planned as far in advance as possible. It's routine in our recovery room for vital signs—blood pressure, pulse, and respiration—to be checked every half hour unless otherwise indicated by the surgeon or the anesthesiologist. At the same time, if any of the following are in use, they are also checked each half hour: levine tube, dressings, drains, intravenous tubing, needles, whether for transfusion or infusion, and oxygen equipment. Tidal drainage or any other kind of drainage also must be checked at that time.

The patient's charts should not be placed in a chart rack or on a table, but should be hung at the base of each bed. In addition, a visual chart with large markings ought to be at the base of the bed, perhaps on a board, on which the nurse marks the vital signs. I think this is important, because then the nurse, the anesthesiologist, the surgeon, or the resident can tell at a glance, what the course of that patient has been. I think it should be unnecessary to have to go to a chart that's in a rack or on a table. You're not worried here about patients or visitors getting to your charts.

SUPERVISION OF UNIT

Who supervises the recovery room? It should not be the O.R. supervisor. She has all she can do to run a good operating room. She should be in close contact with the head nurse in the recovery unit; they should be good friends, by all means, and they should have immediate and direct communication. But the immediate supervisor of the recovery unit is the head nurse in the unit. She should be responsible to the surgical

supervisor, who in turn is responsible to the director of nursing.

On the medical side we have a little different situation. There are two groups of doctors involved: the anesthesiologists and the surgeons. By and large, which one takes responsibility will depend probably on which has the more dynamic personalty, but, in theory, at least, the anesthesiologist should be responsible for signing the patient out of the recovery unit. Until he says that the patient has recovered from anesthesia and his vital signs are stabilized, the patient cannot be discharged. In our recovery unit, the surgeon can order the discharge of his patient only with the concurrence of the anesthesiologist.

The chief anesthesiologist, on the other hand, can order the discharge of a patient from a recovery unit without the approval of the surgeon. He takes responsibility for determining the need to move patients out under pressure from new ones coming in, not the surgeon. The surgeon, after all, works on the individual patient; the chief anesthesiologist has to take a broader view of all the patients who have undergone anesthesia during each day.

The anesthesiologist also is responsible for the patient's position during the operation and postoperatively in relation to blood pressure and pulse—the patient's physiology—and, after all, it's the physiology we're most concerned with in the postoperative phase.

Postoperative group-nursing units have been successful everywhere. We also are proud of our results over the past two years. In over 8,000 operations in this unit, we've had only two cases of postoperative atelectasis, both of which occurred after the patients were transferred out of the postoperative unit into their own beds. We've had no deaths in the recovery unit from shock or hemorrhage or other complications that so frequently caused bad postoperative mortalities and morbidity when patients were cared for in their own rooms.

I don't mean to say we've had no postoperative deaths. But those that occurred were as a result of the impossibility of surgery preventing death in a fatal condition.

What about bringing T & A's into the postoperative recovery unit? We do. We have certain operating time during the week set aside for tonsillectomies, and the children come back into the recovery unit.

We've found it advisable, however, in the case of T & A's, to have nurses other than the recovery room nurses assigned to these children. They start with the children in their rooms before they come into the operating room. When the children are returned to the recovery room, the nurses are there to receive them and remain with them when they return to the ward. That doesn't mean that they supplant the postoperative nurses in the recovery unit, but they're with the children through the entire experience.

We take four to six or eight a day and handle them as a group. In our hands, at least, this has been a successful approach. The children stay in the recovery unit for about three or four hours, or until we are absolutely sure that no postoperative bleeding or hemorrhaging has occurred, and then they go back into their ward.

COMMUNICATIONS

I think the recovery unit should be in direct communication, by telephone, with every place in the hospital. We have two telephones. In addition, I think there should be direct intercommunication between the recovery unit and the central supply, the O.R. supervisor, the anesthesiologist's office, the doctors' and surgeons' lounge and dressing room, and the director of nursing.

If you really have an emergency, there should be some form of emergency bell or buzzer system that activates everybody in a hurry. That occasionally is necessary and ought to be included.

VISITORS

We do not allow visitors to the recovery unit until the operating schedule is over for the day. At 4 or 5 o'clock in the afternoon, visitors may be allowed in for just a few moments, *if* the patient has sufficiently reacted to make the visit desirable, and then only if he is in critical condition or is going to remain overnight. We allow them in for only a few moments at a time.

I think it's a good idea, if you can afford it and have the space, to have two recovery rooms. One should be smaller than the other and should be used for patients who might be visited for a period of time—those who are going to stay for a few days. Or you might have one or two glass-enclosed cubicles in the unit for that type of patient. If you have such a cubicle, access to it for visitors should be separate from the main access to the recovery unit, if possible.

Questions are often asked about the economics of the recovery room operation. I did a little calculating, in an effort to see whether we were losing or making money, and I'm happy to report: We're losing money. I'm one of those administrators who believe that unless a hospital is losing money it's not doing its job.

The way we work it, the first two hours in our recovery unit are part of the over-all care the patient gets on a flat-rate basis. If he stays longer than that, then we charge $2 an hour for a private patient and $1.50 for a semiprivate patient.

I've found that calculating income on that basis and comparing it with what it would cost to provide the same number of hours of special-duty nursing (if you could get it), we would lose $10,000 over a period of a year. I believe that's a pretty good price to pay for *good* postoperative care and for the kind of results we've achieved with it.

I'm sure that you could run a recovery unit and have it pay for itself, particularly if you didn't run it around the clock, seven days a week, 24 hours a day, and if you set your charges high enough. But when you begin to charge patients more than $2 for an hour's care in the recovery unit they begin to think, "What would it cost me to have a special-duty nurse?"

Obviously, on a per hour basis it would cost them less. But since they usually need only two or three or four hours of recovery room care and you can't hire a special-duty nurse for two or three or four hours (you've got to give her at least an eight-hour stint), the total cost would be a great deal more. But try to explain that to patients!

First, you must have a utility room area or alcove, which should be equipped as completely as possible. If you have an adequate central supply, I do not believe you need sterilizing equipment, and I'd prefer not to have it. You should have a separate alcove with a bedpan-washer-sterilizer-flusher; heated cabinets for solutions as well as for blankets and linens; an adequate open storage and an adequate closed storage. I emphasize the need for open storage, because a lot of things should not be placed behind closed doors, even glass doors. They should be right out in the open when you need them.

You should have plenty of space for the storage of larger items of equipment: drainage, suction and intravenous equipment, and so on. You should have a biological refrigerator—one large enough to store blood prepared for a patient in advance.

We have a number of emergency trays that we keep as standard in our unit: a cardiac arrest tray; an intubation tray, with assorted sizes of endotracheal tubes, tongue depressors, a laryngoscope, and universal adapters; a tonsil hemorrhage tray; a tracheotomy tray; a thoracentesis tray; a cut-down tray; dressing sets; a stimulant drug tray with the usual drugs on it—caffeine, coramine, adrenalin, ephedrine, neosynephrine, ergotrate, crystodigin, digitoxin, sedatives, and so on.

Also standard items in the recovery unit are all current antibiotics; narcotics; intravenous vitamins B and C; all stocks of external solutions; all IV solutions (kept in storage); gloves, safety pins, clamps, connecting tubes, recipient sets, clysis sets, intravenous sets, head rolls, basins, tubular gauze, and iodoform packing.

The beds must have conductive rubber casters so that they can be used to take the patient directly off the operating table.

You'll need to include pillows in conductive rubber cases, emesis basins, towels, cloths, wipettes, and IV standards. We've been using the large ones on rollers, but I do think if somebody would design the proper kind of bed to which you could successfully attach an IV, that would be the preferable solution.

You need a number of portable suction machines. Even though you may have suction from the wall and your section in the wall should have adapters, you still need at least two portable suction machines, in case the wall suction doesn't work or in case you want a different type of suction. You need Wangensteen suction.

You should have two to four x-ray shadow boxes because the doctors will want to view x-rays in the unit.

You should have a sphygmomanometer *for every bed*, and you should mount it on the wall behind the bed, so it's not lost. Don't put it on a roll-away stand. Have a long enough tubing and cuff so that you could bring it to the patient. And by all means have children's cuffs and adult cuffs, and plenty of stethoscopes.

Nasal oxygen B.L.B. masks and all the rest of the equipment needed for oxygen administration, humidifier bottles and so on, should be standard equipment.

You'll want a resuscitator. We have two. One is a Stephenson—the one that sucks and blows and gives the combination effect—and for it you must have masks for adults and for children. Then we have a Pneophore resuscitator—the intermittent automatic positive-pressure type, used only with endotracheal tubes in place.

You'll want assorted sizes of nasal airways, metal, plastic, and rubber, and endotracheal tubes, cuffed and plain.

Question and Answer Period

Q. Do you send all patients back to the recovery room, or are the spinals sent back to the floor?

A. We send all patients back to the recovery unit. In fact, in our set-up it works out that way anyway, because the entire operating suite is a "U" shaped unit. The patients enter in one corridor, go through the operating suite, and out through another one. In coming back through the second one they have to go past the recovery unit, and it's natural to take them right in.

Q. Do you prefer beds to cots?

A. If you mean stretchers, I have yet to see a stretcher that in my estimation is quite adequate. We are trying out a new one which is a little wider than the standard stretcher. If the stretchers do work out, they're an advantage, because they don't take so much space.

It's important to think in terms of "one movement only" off the operating table. You should check to make sure that the operating table has sufficient elevation, so that when you get in the right position the table is exactly the same height as the bed you're using.

Q. If a patient has a private nurse, is he taken to the recovery room?

A. He certainly is! We do not believe that the usual private-duty nurse is trained to postoperative nursing care, at least in the initial phases. We allow the private-duty nurse to remain with the patient in the recovery unit. But she takes her orders from the head nurse of the recovery unit during that time. Sometimes she's very useful, particularly when they get very busy.

Q.—Do you use restraints?

A. We use sideboards or side rails. In recent years, the quality of preoperative medication and of anesthesiology is so high that the number of patients who need to be restrained is much less than it used to be. I think it will probably become even less as time goes on.

Q. Where do we place the head of the patient in the recovery room?

A. Toward the wall, so that the nurses, in circulating, are looking at the patient's face, and not the top of his head. That also is the end of the bed that has the low headboard. Actually our headboard and tailboard are the same height, and both are low. But if you have a high headboard you should turn it around and place the patient against the tailboard.

Q. If the patient is retained for a number of days in the recovery room, is the routine room charge eliminated?

A. Ordinarily, no. But every time the problem comes up, if it's a semiprivate or a service patient I'm sure to get a request from social service or from the family for reduction of charges, and so I usually cancel it. It's a double charge and much too expensive for most people. But as a matter of policy we have not eliminated it. I think such a move might stimulate the doctors, under certain circumstances, to keep people in the unit to save them money, and that isn't good hospital economics.

Q. How many patients should a nurse take care of at one time?

A. During the busy hours of the day we always have at least one head nurse, two R.N.'s, one volunteer, and one aide in attendance. So at times we have five people taking care of eight to ten patients. But I think the minimum is: four patients, one R.N., and one aide.

Q. Do you handle outpatients without having a room on the floor assigned?

A. Yes. We admit patients for ambulatory surgical procedures, as long as they do not involve general anesthesia or spinal anesthesia. Sometimes those patients will stay for a few hours and return to their homes without being sent to a room.

In order to achieve the most comfort under those circumstances, we have, in addition to our postoperative recovery unit, a separate recovery room, located in a slightly different area from the major operating facilities, although it is on the same floor and in the same suite. It's right next to a minor operating unit in which we do most of our endoscopies.

This little room is fitted out as a sort of waiting-room. It has a nice cot, a table, a chair, a lamp, and reading material. Patients will spend an hour or two there after a procedure before they go home. A paper written recently by a British surgeon told of doing herniorrhaphies on children in the outpatient department on an ambulatory basis and sending them home, and getting as good results as when patients are admitted to the hospital.

Q. Do you send cesarean sections to the recovery room?

A. No. Our cesarean sections are not done in the operating suite. Our delivery unit has three delivery rooms, all of which are fitted out and equipped for major surgery. One of these is designed specifically for cesarean sections. When we planned that unit, we did not plan an O.B. recovery room. Since then we've had requests from the house physician for an O.B. recovery unit, and we're planning one.

Q. What do you think about having the recovery room as part of the student's teaching program?

A. I think that you couldn't have a better unit for teaching purposes anyplace!

ASEPTIC TECHNIC – A SYMPOSIUM

from the Third Annual Conference, Association of Operating Room Nurses

Methods of Practical Approach

By Genevieve Young, Ph.D.*

IF eternal vigilance is the price of freedom, it is also the price of asepsis. This is a subject on which we have tended to become a little complacent, as though all the problems had been solved, yet we all know that postoperative infections do occur, and that the danger, far from disappearing, is in fact becoming greater.

All of the modern advances in surgical technic—the improvements in methods of anesthesia, hemostasis, and combatting shock, and the use of antibiotics—all these have tended to increase, as an English writer has put it, *the length and scope of surgery*. This means a proportionate increase in the exposure of unprotected living tissue to microörganisms. On this score alone we have need of increased vigilance in asepsis.

In addition, we have always with us the variety and variability of living organisms. The kinds of microorganisms with which we have to contend in surgery differ from time to time and from place to place. New personnel, new patients, as well as non-living materials, may introduce new bacteria to the scene.

The problem is further complicated by the fact that microörganisms frequently undergo inheritable changes or mutations, such as an increase in resistance to an antibiotic. When this occurs in the hospital environment, the sensitive strains are quickly destroyed, leaving the resistant types to multiply unhampered. As the organisms change, so also does the problem of destroying them.

There are also new dangers from technics which have nothing to do with surgery as such. I refer to the introduction of television into the operating room, which certainly poses new problems in asepsis.

To make our material as practical as possible, let us consider the actual degree of danger from the various

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sources of contamination in the operating room. Many operating room nurses may be familiar with Meleney's listing of these sources in their order of importance:

(1) The upper respiratory tract of the personnel
(2) The hands of the personnel
(3) The skin of the patient
(4) The air in the operating room
(5) Instruments and materials.

This order is interesting, because in the recent past instruments and materials have received the greatest amount of attention. Now the emphasis has shifted back to the air. Lister, too, recognized the importance of air in this connection and attempted to prevent suppuration by excluding air from wounds. It was only after failure in these attempts that he resorted to destroying the organisms which had gained entrance to the tissues. To some extent, this situation still exists; bacteria from air do contaminate wounds, and we do destroy them there, substituting antibiotics for Lister's carbolic acid.

Let us begin at the bottom of the list and work up. Instruments and materials are last not because they are least important, but because we have been successful in dealing with this source of infection. Even here, however, we cannot rest content. An autoclave, or any other instrument, no matter how "automatic," is no better than the people who run it, or those who repair it, or even those who made it in the first place.

FREQUENT TESTING NECESSARY

Frequent testing by placing spore-forming bacteria in the center of bundles to be autoclaved, and subsequently attempting to grow them, is the only real assurance of sterility. The practice should not be discontinued because of a long series of negative tests. We do not stop testing our drinking water because we have not had a typhoid epidemic in 50 years.

The effectiveness of chemical disinfection or sterilization should also be tested at first hand, under the conditions of actual use. It is legitimate and useful for the manufacturer to report on the effectiveness of a chemical agent in killing specific test bacteria under controlled laboratory conditions, but the buyer must take the responsibility for making sure that it works in his situation. It is one thing to kill a pure culture of bacteria suspended in a solution; it is quite another to destroy the same organism when it is covered with dried blood.

Furthermore, chemicals do not have the same effect on all microörganisms. There is considerable variation in this respect, even among the non-spore-forming bacteria which appear frequently in surgical infections. The virus of serum hepatitis, which must be considered whenever we are dealing with blood-stained materials which may subsequently come in contact with tissue, survives most ordinary sterilizing procedures except autoclaving.* This insidious organism, which may be present in the blood for long periods without clinical evidence, has been repeatedly transferred by blood lancets.

In actual practice we cannot separate the fourth item, the air of the operating room, from the first, the

*ED. NOTE: WHO-Expert Committee on Hepatitis also approves boiling water for 30 minutes or exposure to dry heat at 180° C. for one hour.

respiratory flora of the personnel. If, however, we exclude direct respiratory contamination for the moment, this leaves dust, or, shall we say, particles, which have been present in the environment over a longer period.

I shall not discuss the engineering advances which make it possible to introduce relatively bacteria-free air into the operating room, or ultraviolet lamps, which, with proper circulation of air, may destroy many of the organisms exposed to the radiation. They are extremely valuable, but organisms from many sources may become suspended in air after it reaches the room, and these may well come in contact with the tissue of the patient before reaching the zone of ultraviolet, above eye level.

Keeping in mind the fundamental fact that microorganisms do not jump or leap or fly about, but are always passively transported, and that they adhere to moist or oily surfaces, we may conclude that any dry, nonsterile surface from which bacteria may be dislodged, is a potential source of contamination. The dislodging of the bacteria and their subsequent movement in air are proportional to the number of persons in the room and the amount of movement of each.

The next source of infection is the skin of the patient. As you know, it is practically impossible to sterilize the skin. After thorough disinfection of the skin surface, cultures made from the cut sides of an incision showed bacterial growth similar to the normal flora of the untreated surface. The old problem of killing bacteria without injury to host tissue is still with us.

The hands of the personnel come next on our list, and here again I believe the only convincing way to evaluate a method of disinfection is to make simple cultures from the hands before and after disinfection, and when gloves are removed. Sweating brings more bacteria to the surface of the skin after disinfection, and the warmth and moisture inside the glove tend to promote growth and reproduction of the organisms present; so a check at the end of the operation, as well as at the beginning, is informative.

NO. 1: UPPER RESPIRATORY TRACT

We arrive finally at Number One on our list, the upper respiratory tract of the personnel. Perhaps we should include the patient here. If he talks or coughs during the induction of anesthesia, he is as good a source of coagulase-positive staphylococci as a member of the staff.

Advances in bacteriology have given us a better knowledge, in recent years, of what we may call the "epidemiology of surgical infections." In the past, it was common to identify the two kinds of bacteria most often associated with postoperative infections, streptococci and staphylococci, under these general headings, with perhaps some reference to their hemolytic action.

Since both types of bacteria are widely distributed, this generic identification gave no clue to the source of the organism. This situation has now changed considerably. Streptococcal postoperative infections have declined rapidly since the advent of antibiotics, while the number of staphylococcal infections has increased, and we are able to identify these staphylococci much more accurately than before. Two methods are commonly used:

(1) Testing their resistance or susceptibility to the action of various antibiotics.

(2) Testing their susceptibility to lysis by specific bacterial viruses or bacteriophages, "phage typing."

By such tests it has been possible to show that a series of postoperative infections were all caused by the same type of staphylococcus, and that this organism was present in the respiratory tract of only one member of the operating team. In another case of infection in which a glove was known to have split, it was shown that the staphylococcal strain from the patient was not present on the skin of the surgeon whose glove was damaged.

A further indication of the importance of the respiratory tract as a source of surgical infection is the fact that the staphylococci found in so many of these cases are antibiotic-resistant strains. Such strains are commonly found in the nose and throat, but rarely on the skin.

Also favoring the theory that skin is a less important source of contamination than the respiratory tract is the report that surgical infection in some hospitals is more frequent in winter than in summer. Skin bacteria increase in warm weather, with sweating, while respiratory organisms decline at this season.

The bacteria found in the air of the operating room have in some instances been shown to be strikingly similar to the organisms in the noses and throats of the personnel. The bacterial content of the air drops, as would be expected, when the room is empty; but even stirring up the dust with fans does not increase the number of the particularly dangerous types.

There is evidence that in some cases of surgical infection we may actually be dealing with a devious type of cross-infection. As you know, there has been an increase over the past several years in the number of antibiotic-resistant strains of microörganisms. Bacteria vary in their susceptibility to these agents, and when the susceptible ones are destroyed, the survivors develop into what is essentially a pure culture of the resistant type.

INCREASE IN 'HOSPITAL STRAINS'

Such strains of resistant staphylococci have increased tremendously in the areas in which antibiotics are used most—that is, in hospitals. These may truly be called "hospital strains." They are found more frequently in inpatients than in outpatients of the same institution, and they are found very often in the personnel.

As a result, we have another of those famous "vicious circles," in which nurses or other staff members may pick up antibiotic-resistant strains of staphylococci from infected patients in the wards, carry them in their upper respiratory tracts, and later, in the operating room, project them into the air from which they drop into the tissue of the patient and give rise to new surgical infection.

This is not unsupported theory. A group of student nurses, completely free of antibiotic-resistant staphylococci on entering the hospital, were studied again

after five weeks on the wards; 30 percent had become carriers of these organisms.

There is no simple solution to this problem. Bacteriological studies of the respiratory flora of the personnel make it possible to exclude heavy carriers of dangerous organisms from the operating room, or, if this is not practical, to make such carriers aware of the danger. The individual who knows he is a potential source of infection is likely to be more scrupulous about his mask technic, and about staying away from the operating room if he has any tendency to sneeze or cough.

Talking can be cut down, although this is undoubtedly the most difficult of all restrictions to impose. We all know that with the mouth closed, quiet breathing through the nose produces expired air which is sterile, or nearly so, and that the number of organisms discharged through the open mouth is proportional to the force of expiration. If talking is necessary, then it should be done with minimal pressure.

It should also be remembered that air can become contaminated before or between actual operating procedures. The wearing of masks, the ban on talking, and similar precautions should apply at these times, also.

Application in the Operating Room

By Doris Davis, R.N.*

THE aseptic technic that we use at the present time is not exactly a stable thing. Procedures we are following now have taken a great many years to discover. No doubt a great many new things will be brought out in years to come that will influence greatly and perhaps change many of our present methods.

Aseptic technic is not solely the responsibility of operating room nurses, but of most of the personnel employed within any hospital. Aseptic technic may be carried out in surgery to the best degree that we know how, and yet have its failure in caring for the patient on floors below, because of contaminations in dressings, and so on.

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So all personnel attached to all hospitals should have some knowledge of aseptic technic. It is not only concerned with sterile instruments and dressings in surgeries, but with housekeeping, linen, clothing, skin preparation, and many things too numerous to mention.

As Dr. Young stated in regard to air-borne bacteria, there is always an excessive amount of talking in every surgery. There's always an excessive amount of laughing, which we have tried very hard to eliminate. We do suggest that all persons who come into an operating room be free from colds. Anyone who has a respiratory infection of any kind has no place on an operating team.

Usually, we try very hard to have personnel adequately cover their noses and mouths with masks. But operating room nurses know that surgeons often feel that their noses must be out from underneath the mask in order that they may breathe adequately.

Operating room nurses, and primarily supervisors, are usually called grouchy because they keep bringing up these "silly technics" that they feel should be carried out. If the procedure is absolutely bacteriologically sound, the supervisor can prove to the surgical team that she is the person who must see that aseptic technic is adequately carried out within the operating room.

As far as the masking of the nose and the mouth is concerned, it has been suggested that these masks become moistened with bacteria within a relatively short time, with the talking that goes on within most surgeries. It has also been suggested that masks be changed as frequently as possible, in order to help eliminate some of these bacteria which eventually are expired into the air. The mask put on at 7 or 8 o'clock in the morning is not adequate at least half an hour to an hour after it is put on, primarily because of the bacteria which have accumulated as a result of the talking necessary in giving explanations regarding the operation.

To guard against air-borne contamination and spore-forming organisms, it is essential that as far as possible all dirt and dust be removed from the operating room. Many surgeries today have been constructed with that thought in mind. Usually they are so built that walls and cabinets can be easily washed. Cabinets should be enclosed, and also should have glass shelves.

As little equipment as possible is put in each operating room, and it can be quickly and easily washed with soap and water.* Here we'd like to comment that there is no place in any operating room for a dry mop or a dry dust cloth.

It's been said many times that bacteria do not have wings and they cannot fly—so they must be carried from place to place by personnel. Street clothes and street shoes have no place in an operating room. Clean gowns, clean suits for the doctors, and clean shoes are essential to good technic.

Many questions about sterilization have been asked by operating room supervisors. Most of us are aware that the best means of sterilization is heat, and, as we know it, steam under pressure.

Certain things have to be accomplished before any sterilization is done. In order to sterilize instruments

*ED. NOTE: Detergent-germicides are available which, besides cleaning, suppress bacteria.

properly, they MUST be clean. Many hospitals today feel that after cleaning instruments it is necessary to oil them to keep them in good working order. This practice has been proven quite erroneous, and it hampers sterilization, because moisture will not penetrate oil.

It is also recommended that instruments be autoclaved open. If moist heat is used, it must have some way of getting within the lock, so that all parts of the instrument may be sterilized.

Almost every instrument used today, including scissors, can be autoclaved. It is not true that putting scissors into the autoclave will dull the sharp blade of the instrument. Most of the dulling of sharp scissors comes from misuse, not from autoclaving.

It is recommended that a chemical solution be used for sterilizing knife blades and dermatome blades, because of their honed edges.

There has been a great deal of controversy over chemical sterilization. If chemicals must be used, certain criteria must be met. First, the instruments must be clean, absolutely free from any dirt, oil, or blood. Second, they must be completely submerged within the solution. Third, they must remain in the chemical for a stated period of time. Usually, with most of the chemicals on the market today, 30 minutes is adequate time to kill vegetative forms of bacteria. Eighteen hours must be used as the time limit for the destruction of spores.**

**ED. NOTE: Because the virus of homologous serum jaundice is destroyed only by heat, chemical disinfection cannot be used where an instrument or blade has been contaminated with blood.

Dry heat may be better for sterilizing very sharp instruments. The only disadvantage is the time involved in sterilization. It is recommended that instruments be sterilized at 160° C. for one hour.

If the hospital has no dry-heat sterilizer, instruments may be put into the chamber of the autoclave and the door closed tightly. Steam in the jacket is 250° F. The instruments are allowed to remain for four hours or longer. This method will give the same results as a dry-heat sterilizer.

WASHER-STERILIZERS RECOMMENDED

The washing of instruments and their storage after an operating day are very important in helping to eliminate bacteria. Fortunate are the hospitals that have washer-sterilizers. With a washer-sterilizer one can be absolutely sure that instruments, if placed in the washer open, will be clean. The addition of a detergent prior to placing the instruments in the washer will help in cleaning. The boiling water under pressure within the washer-sterilizer will cause all the blood, oils, and so forth that have accumulated on the instruments to rise to the top of the washer. The boiling action puts that same exudate on top into an overflow tank, then down into the reservoir and out the drain.

These instruments, when removed from the sterilizer are clean, dry, sterile and ready to be stored or used in a subsequent operation.

Instruments should be stored in closed cabinets. There is so much activity in operating rooms, corridors, and instrument rooms that there is always a possibility of

dust contamination if cabinets are not kept closed.

In the sterilization of tubed sutures, one should remember that there are two kinds of solutions used for tubing fluid. One may be autoclaved; the other will not withstand heat and the tubes containing this solution must be disinfected by chemical means. The disinfecting solution used must be of a low specific gravity, so that the tubes stay completely submerged within the solution. The solutions recommended are 70 percent alcohol with distilled water and formaldehyde.

It is not necessary to sterilize the cover which is going to be put on top of the jar. The fumes from the solution itself will, over a period of time, actually sterilize the cover.

In many surgeries a certain day has been set aside for the resterilization of dry goods, sutures, and knife blades. It has been proven that much of this is unnecessary. If catgut tubes are kept completely submerged in a solution, it is not necessary to do weekly resterilization. The catgut can remain in the jars until used without resterilization provided the solution is kept up to volume.

Other forms of sutures, such as silk, nylon, and cotton, may be adequately autoclaved. Any of these dry sutures should be moistened with water before autoclaving, to aid in keeping them from becoming superheated. As soon as the materials become superheated, the sterilizing power of the steam is lost, and the material is not sterilized.

Sterilization of knife blades and elimination of bacteria on them in surgery have been adequately taken care of by Bard-Parker's solution. The company states that this solution will kill vegetative forms of bacteria in five minutes, and that spore-forming organisms may be killed in three hours.*

If dry goods are stored within a dust-free cabinet it is not necessary to resterilize linens weekly. Very few surgeries have a layover of surgical goods from one week to the next. Most supplies are replenished daily.

Skin preparation has been a great controversial question. We cannot make skin sterile. Skin preparation, both in the cleansing of the hands and the arms of the operating team, as well as the operative site, is of great importance.

Mechanical cleansing again has come into its own, and it is essential in order to remove transient and resident bacteria from the skin. In many hospitals it has been stated that for major operations you should scrub 10 minutes, and for minor operations, five minutes. It is much better to base the scrub on the fact that each anatomic area of the skin receives the same number of strokes, rather than to use a stated length of time. A five-minute scrub may mean that one hand and arm are scrubbed twice, while the other hand may be scrubbed only once.

Brushes which have been adequately autoclaved and are stored in a 1:1000 solution of Zephiran are of great help in ridding the skin of some of its bacteria. However, if Zephiran is used, the brush must be thoroughly rinsed before and after use with soap. Zephiran (and

*ED NOTE: Chemical disinfection should be used only on new or unused knife blades.

quarternary ammonium compounds in general) is incompatible with soap and causes dermatitis.

For the patient's skin preparation, the operative site should be thoroughly cleansed to rid the area of any bacteria. The technic depends on the operative area, the position in which the patient may be placed, the type of work the patient may do, and the type of bacteria which may reside on his skin. But again we go back to mechanical cleansing, and it is always advisable for all patients to have an adequate soap and water scrub before the incision is made.

Some germicides used to enhance this scrub include 70 percent alcohol, a 1:1000 Zephiran solution, and a one percent aqueous iodine solution. Seventy percent alcohol is used to cleanse off the excess iodine.

ESSENTIALS FOR CHEMICAL DISINFECTION

Dr. Carl Walter, in *Aseptic Treatment of Wounds**, mentions three essentials for chemical disinfection of skin:

(1) An adequate period of exposure to the germicide.

(2) Maintenance of the germicide at its most efficient concentration on the skin, since as germicides dry their power to destroy bacteria is lost.

(3) Friction to enhance germicidal power, by aiding the germicide in penetrating to the organism.

It is also important that an adequate area be prepared, so that there is no chance of contamination in the area surrounding the incision.

Drapes should be carefully placed, so that those falling below the operative area are not pulled up into the operative area itself.

The care and terminal disinfection of instruments and drapes from contaminated cases are important in guarding against cross-contamination.

The technic described in Dr. Walter's book is simple, and can be carried out by one nurse within the room.

The patient under our care is our most important responsibility. May we always be alert to new methods and ways of improving our present concepts of aseptic technic.

*Walter, Carl W., M.D., *Aseptic Treatment of Wounds*, published by the MacMillan Co., New York, 1948.

Aseptic Technic in the Postdoctorate Program

By Carl W. Walter, M.D.*

THE title originally assigned me was "Aseptic Technic in the In-Training Program." I changed it largely to emphasize the fact that doctors are not trained in this area by hospital programs. Doctors can be educated, their interest challenged, and their co-operation won.

I would like to make an extemporaneous attempt to pull these lectures together and use the information of the other members of the panel as an illustration of a presentation of the facts of aseptic technic to doctors in a positive fashion. In this way, I hope nurses will be able to win their support in bringing aseptic technic to bear on the most serious medical problem that faces hospitals today.

That problem is an ever-increasing burden of postoperative sepsis around the world. The organism involved, the antibiotic-resistant staphylococcus, is hardy, withstands long periods of drying, and survives in most environments. Sepsis due to these bacteria has been studied in England, New Zealand, Canada, and the United States. One of these studies, presented in the *New England Journal of Medicine*, over a year ago[1], showed that in one Boston hospital, postoperative sepsis was recognized as increasing one-half of one percent annually the last five years.

This type of sepsis is very important because there is no method of control over the spreading disease, other than that originated by Lister, von Bergmann, Schimmelbusch, and Neuber, when they first solved the problem of postoperative sepsis 75 years ago. Currently we are faced with the task of educating the profession, making it recognize the problem, and defining its responsibility for a solution.

One of the big difficulties in this pedagogic area lies in the fact that doctors understand too quickly and fall victims to that remark phrased by Oliver Wendell Holmes: "Some will never learn anything because they understand everything too soon." This certainly applies to the profession broadly when discussing something as apparently simple as aseptic technic.

The task is not only to make understanding easy but to make it penetrating enough so that it elicits interest and co-operation. To do this, the problem must be defined in terms characterizing the individual hospital. I have said the problem is world-wide; therefore it affects your hospital. We must marshal facts which

[1]Howe, C. W., "Postoperative Wound Infections Due to Staphylococcus Aureus," *New England Journal of Medicine* 251: No. 11, September 9, 1954.

*Dr. Walter is associate clinical professor of surgery, Harvard Medical School, Boston, and surgeon, Peter Bent Brigham Hospital.

will support the existence of this problem in the local hospital and which will simultaneously outline a solution.

The illustrations accompanying this article are all taken from articles in the literature; none of them is original work. They should illustrate that all the facts necessary to solve this problem are available in recognized professional literature.

Operating room nurses can be proud of the papers presented at this session, because they give evidence that people charged with the responsibility for aseptic technic are competent to marshal facts, to gather data, and to present them clearly. I mention this to point out that written presentation need not come from outside your institution. You have but to sit down, think the problem through, and outline a presentation of your own problem.

You will then need co-operation for solution of the problem which you have defined and presented. This co-operation will only be forthcoming in this field when you have educated the doctors to the need for their co-operation. I will try to show you why that co-operation is so essential.

HOSPITAL PRACTICES MUST CHANGE

It stems essentially from the fact that hospital practices must be revolutionized to gain safety for the patient. Broad reform is required in most departments of the hospital to break down this chain of sepsis. Since most studies show that this type of postoperative sepsis is air-borne, attention must be directed to sterilizing the air as well as instruments and supplies. There is an enormous amount of organized negligence dedicated to keeping air-borne bacteria maximal in number—always associated with lots of foreign bodies and always of the most virulent type.

Co-operation from the profession itself is needed on a few goals which I will enumerate without elaboration:

(1) The prophylactic use of antibiotics must be recognized as a positive factor in perpetuating this problem.

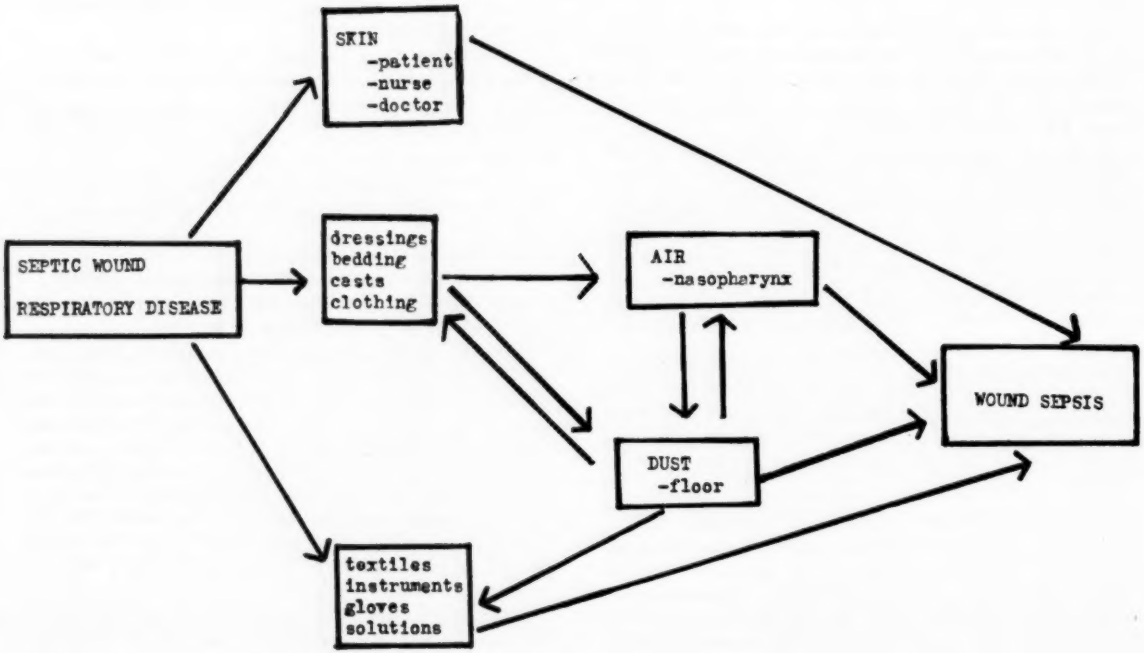
(2) Doctors must be shown that they carry organisms around on their clothing, in their clothing, and on their shoes.

(3) Doctors must be convinced that dressing technics are responsible for much of the spread of disease.

(4) Doctors must realize that cast-cutters and bandage scissors are powerful vectors in spreading disease.

(5) The institution must be evaluated from the point of view of demonstrating the safety and usefulness of several things. For one, the ventilating system, not only in the operating rooms but in the entire hospital, must be positive pressure in nature, so that it delivers clean air rather than polluted air. Laundry practices must be observed critically. Organization of the laundering process must be corrected to avoid the distribution of dangerous organisms. Linen is seldom sterile as it comes from the laundry, and I will explain why later.

(6) Good housekeeping in the operating room should be obvious, but housekeeping on the wards to prevent the spread of disease from patient to personnel and from personnel to patient is equally important.


SKIN
-patient
-nurse
-doctor
SEPTIC WOUND
RESPIRATORY DISEASE
dressings
bedding
casts
clothing
AIR
-nasopharynx
WOUND SEPSIS
DUST
-floor
textiles
instruments
gloves
solutions

(7) In the operating room itself, co-operation of the profession must be elicited to prevent contamination of the floor. Instruments, supplies, etc., must be terminally sterilized routinely to prevent disease-producing organisms from gaining access to the institution in general.

A flow chart of sepsis might look like the one on the opposite page.

The septic wound represents the source of our troubles in the hospital, because dangerous organisms grow in infected wounds. Pus from these wounds get on dressings and bedding, and dried organisms are whisked into the air during careless dressing of wounds or bed-making. They are inhaled by personnel, who are then carriers of staphylococci. As these persons talk, laugh, sneeze, or sigh, the staphylococci are expelled into the air, and the infection spreads to other personnel and patients.

The problem of the doctor palpating the skin around a wound for tenderness is always with us. He picks up organisms on his fingers and carries them to his next patient.

During respiratory infections, the secondary invaders, such as the staphylococci, overgrow and contaminate very heavily clothing, handkerchiefs, hands, and, indeed, everything about the victim of the respiratory disease.

These two factors represent the origin of the staphylococcus problem. The person with staphylococci in his nose, staphylococci on his skin, or staphylococcal furunculosis sheds organisms like a road-sander when he walks into the operating room.

You can trace the "feedback" circuit of the patient with a septic wound or osteomyelitis or a cast or a septic dressing. As the cast or dressing is removed and tossed into the kick-pail, the room is dusted with organisms, and the cycle begins again.

The importance of the skin of the hands and of the patient is represented in column 2 of the chart. Hands are significant, because anywhere from 30 to 60 percent of gloves are punctured during the course of an operation, and the accumulated glove juice runs out into the patient's wound. Any staphylococci present are thus planted directly into the wound.

The sterility of such things as textiles, instruments, gloves, and solutions is subject to definite control and inspection. This area represents what we have been wont to think of as good aseptic technic, and I do not believe it needs further elaboration here.

Air is the vehicle for spreading sepsis, simply because it carries the organisms with dust from one place to another and bacteria settle out of the air into the open wound. All wounds are contaminated in this way, despite elaborate aseptic technics.

That contamination may be dangerous when there is devitalized tissue of hematoma left behind by the surgeon, or when certain foreign bodies are implanted. It is overcome very quickly and easily if the contamination is minimal and the wound has viable surfaces to permit the natural healing process to eliminate the bacteria promptly before they become infective.

FLOOR IS RESERVOIR FOR SEPSIS

The floor is the big reservoir for sepsis in the hospital. It is the common denominator which is inade-

quately cared for in most institutions. Whether you spit the organisms from your mouth, sneeze them out, rub them from your skin, brush them off your clothing —whether they come from dressings, blood, and pus spilled on the floor, discarded plaster casts, or suture ends discarded to the floor—they all aggregate on the floor. Any activity mobilizes the dust and bacteria, and air-borne contamination results. We must pay more attention to the floor!

The place of clothing, bedding, dressings, and casts in this scheme of sepsis you can trace. You can appreciate how spittle, pus, and desquamating epithelium on these things are sources of bacteria which are carried into the air in the form of dust or lint when beds are made or dressings changed, or when there is just general activity.

This is the general flow chart of sepsis which I suggest you use as an outline for the presentation of the facts of your own problem to your staff.

There are various technics possible for gathering the necessary data. Nasal cultures are made by slipping a sterile applicator into the anterior nares, moving it about lightly, and then dropping it into a tube of broth.

The contamination on bedding, clothing, and dressings can be analyzed very simply by whisking the open end of an agar-bearing petri dish across their surfaces.

Square centimeter areas of the floor can be cultured, using an ordinary piece of adhesive from which a centimeter square has been cut. The adhesive is stuck to the floor, and the exposed square of floor is scrubbed with an applicator and sterile water. The water is aspirated into a membrane filter as you scrub.

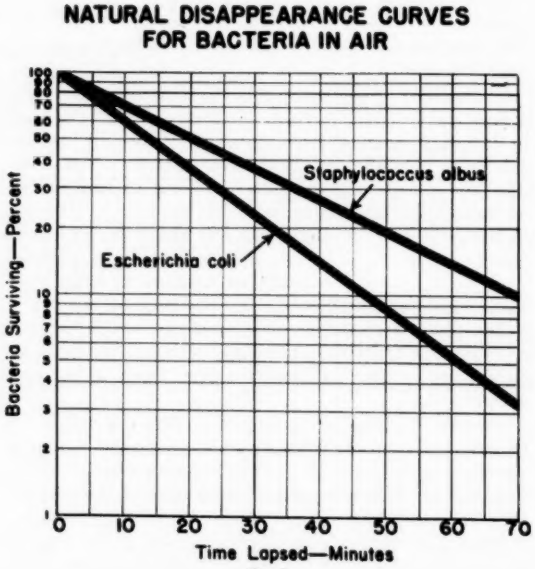


Fig. 1

The air is easily and conveniently cultured with membrane filters.

This type of bacteriology is not to be confused with sterility testing. This technic of culturing is readily mastered and much more significant.

Some typical data gathered from the literature are illustrated in the accompanying figures. *Figure I* demonstrates the die-away curve for ordinary air-borne bacteria. In a room that has been closed for six or eight hours and brought to a relative humidity of 50 to 60 percent, the air is sterile because the bacteria have settled out on the floor. The air remains sterile until some activity stirs the bacteria from the floor.

Once a peak of activity is reached and the room is closed again, the bacteria will settle out in various patterns, depending upon the relationship between their electrical charge, their size, and the amount of dust present.

Air-borne bacteria can be destroyed quickly with an aerosol. *Figure II* shows that the disappearance time is very rapid after dispersal of an aerosol. Aerosols vary in effectiveness, but they all require careful attention. None is effective in low relative humidity, such as exists in a steam-heated room. None is effective in a room in which there is a high proportion of foreign bodies in the form of dust. To be effective, they must be applied under ideal conditions.

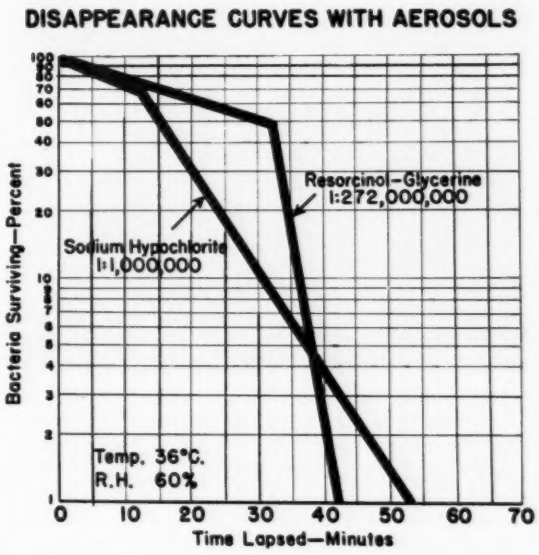


Fig. II

Fig. III

Bacteria from various sources are shown in the other illustrations. *Figure III* is an ultra-high-speed photograph of a cough. The dispersion of droplets is obvious.

Figure IV is an ultra-high-speed photograph of a sneeze. If you are a skilled smoker and can inhale and then sneeze, you can get a very dramatic picture of the dispersal of bacteria by watching the smoke after you sneeze. It travels very quickly, and there is very little difference between the trajectory of smoke exhaled forcibly and bacteria which are expelled.

Fig. IV

Figure V illustrates well the averaging effect of masking. Masks filter an enormous number of bacteria from the air you expire as you talk, laugh, sneeze, or sigh. As many as 47,600 bacteria are expelled when you talk without a mask. When you breathe quietly, droplets are trapped on the mask and dry. The bacteria collected on the mask are forced out as you breathe and gradually contaminate the air. The longer a mask is worn, the heavier the rate of contamination. This is pointed up in the chart by the increased number of bacteria expelled through a mask (315) as compared with the number during quiet breathing unmasked (259).

Fig. V

THE FILTERING ACTION OF MASKS

	Tube Count (Indirect Contamination)		Plate Count (Direct Contamination)	
	Average	Maximum	Average	Maximum
Surgical Masks				
Quiet breathing without mask	8	20	78	259
Quiet breathing with mask	19	99	91	315
Talking without mask	54	337	3,247	47,600
Talking with mask	35	120	194	620
Industrial Masks				
Quiet breathing without mask	4	15	20	65
Quiet breathing with mask	5	15	22	44
Talking without mask	31	62	1,089	4,200
Talking with mask	7	32	61	130

CHANGE MASKS FREQUENTLY

Masks should be changed as frequently as possible, with a 30-minute maximal-use time. They should not be released and hung around the neck to dry and then put back on again. They should be discarded after 30 minutes of use, laundered, and sterilized for re-use.

Figure VI shows the relationship between the amount of activity in the operating room and the bacterial count. Note the low count with still air. Slight activity, as little as stepping two steps into the room and standing motionless, causes an enormous number of bacteria to rise from the floor. The bacteria settle down in the still air over the next 30 or 40 minutes. The relative humidity in these studies was 60 percent. If it had been five to 10 percent, the settling-out time would have been three or four hours.

Figure VII shows the relationship between activities of various degrees. The column at the left is the bacterial count with an individual standing motionless; the next column, the count with him performing slight activity—as simple as removing and replacing spectacles.

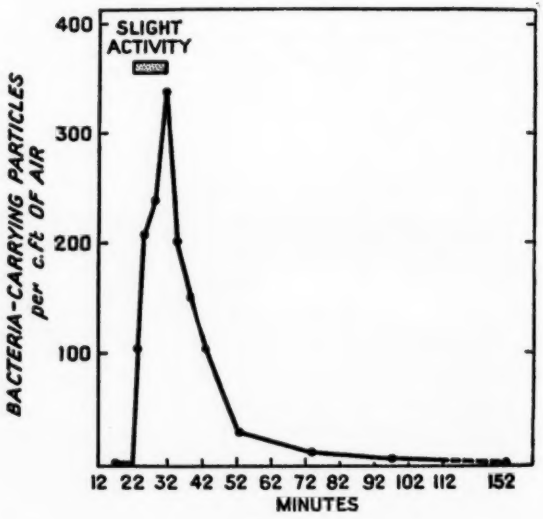


Fig. VI

The next column shows the count during more vigorous activity, such as marking time in one spot; the next, during the amount of activity in dressing and undressing, and the last column, the count with simple brushing of a sleeve with the opposite hand. All studies were made with ordinary clothing which had been worn around the hospital by personnel while caring routinely for patients.

Figure VIII depicts bacteria freed during vigorous activity. The second column indicates 837 bacteria in the air as the result of relatively vigorous activity in a business suit. The 493 bacteria of the middle column are the result of comparable activity in a business suit covered with a sterile surgical gown. This illustrates well the ability of bacteria to escape around a protective gown. The column on the right represents the same degree of activity but in dust-proof gowning. In other words, it illustrates the effectiveness of a freshly laundered scrub suit, clean shoes, and a surgical gown in minimizing the number of air-borne bacteria from this source.

These studies emphasize the importance of having anybody entering the operating room remove street clothing for clean, dust-proof clothing. Bacteria-laden clothing must be left outside the room and replaced with freshly laundered, bacteria-free clothing.

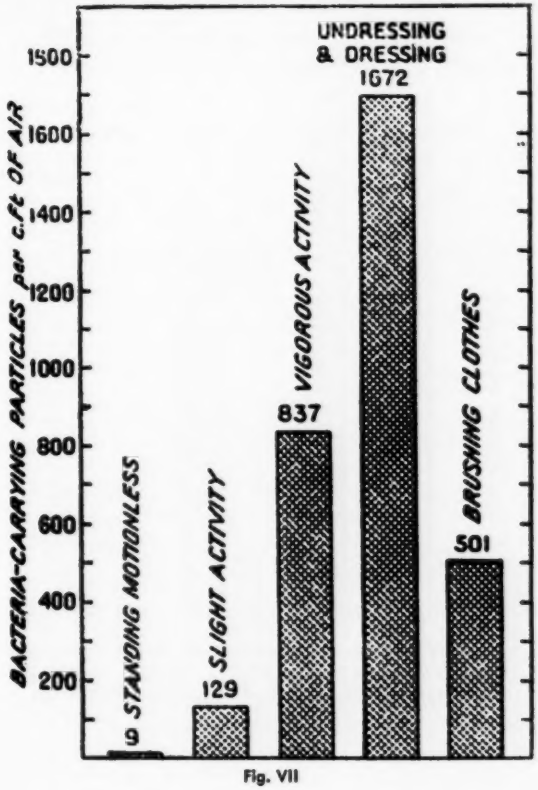
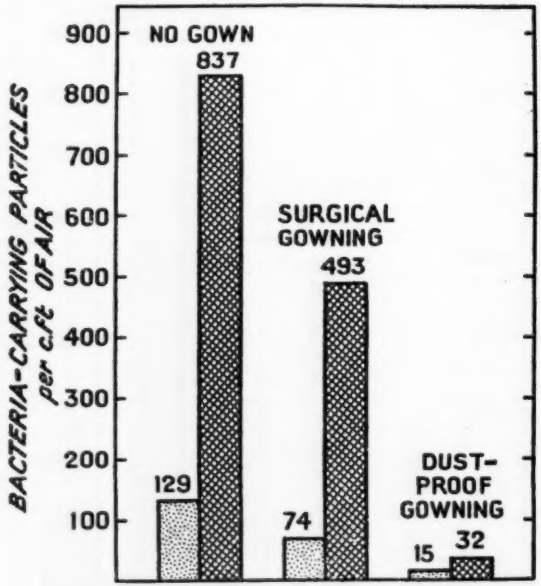


Fig. VII



Influence of gowning on air infection: stippled columns, after slight activity; hatched columns, after vigorous activity.

Fig. VIII

Figure IX shows the combined problems of poor ventilation, unclean floors, unclean shoes, and unclean textiles in relation to a hospital in which 18 percent of postoperative wounds were septic. The black areas represent sepsis due to antibiotic-resistant staphy-

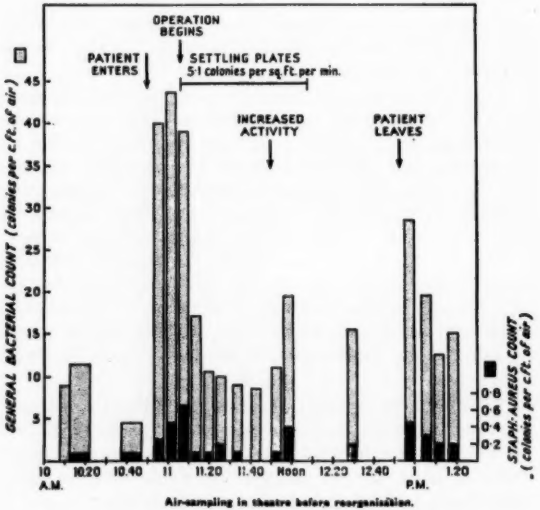


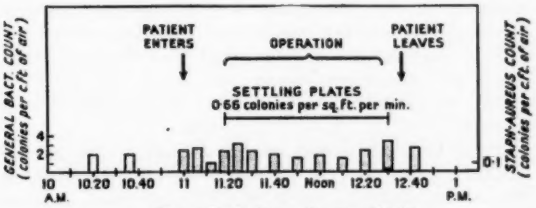
Fig. IX. Hospital Before Reorganization

lococci; the gray areas above represent sepsis due to mixed organisms—enterococci, proteus, or pseudomonas.

Beginning at the left, the first column shows a rise in bacterial count as the nurse enters the operating room. The tall column indicates the count at the beginning of the operation, after the patient had been wheeled in and the nurses had opened bundles.

As the operation progressed, activity lessened, and there were fewer organisms. When personnel were shifted at noon, activity and bacteria increased. Between then and 1 o'clock, when the operation ended, bacteria settled down again. As the patient was readied to leave the room, there was generalized activity, and you can see the number of bacteria which were whisked into the air.

Figure X shows what can be accomplished with control of all the factors contributing to air-borne contamination—floors, clothing, and ventilation. There are only two organisms per cubic foot instead of hundreds.



Air-sampling in theatre after reorganisation.

Fig. X. Hospital After Reorganization

What accomplished this? This hospital is 3,000 miles from Boston, in a completely different environment and with different methods of housekeeping; so we can discuss it freely.

Ventilating systems were changed from exhaust to positive pressure. Filters in the systems were washed regularly with a germicide to insure their cleanliness. Ventilating air was introduced from outdoors instead of being sucked in from elsewhere in the hospital.

Floors were scrubbed daily with a detergent-germicide mixture which left them truly clean. Laundry was treated with a detergent-germicide to destroy the organisms which recontaminate clean linen. All the doctors wore freshly laundered clothing in the operating room. All shoes worn in the operating room were confined to use in that area and disinfected after use. These simple maneuvers brought air-borne contamination under control in this hospital and rewarded the institution with the dramatic improvement illustrated in Figures IX and X.

How can we control these problems in our own hospitals?

For one thing, the co-operation of the administration in changing laundering practices must be elicited. In most laundries, soiled laundry is sorted in the laundry proper. This practice fills the air with bacteria freed from the linen. After washing, the clothes are taken from the washers and put into centrifugal extractors, which suck the contaminated air from the laundry back into the clean textiles. As the laundry is dried and mangled in the same environment, the air-borne contamination is increased.

Ideally, the sorting room should be separated from the rest of the laundry functions, so that this recontamination is impossible. Laundry should be treated with a watery emulsion of white oil to repress lint formation. A quaternary ammonium compound added to the final rinse water will make the textiles actively bacteriostatic. When bedding treated in this manner is subsequently contaminated with respiratory and wound discharges, the bacteria are destroyed rather than distributed.

During the care of the individual patient, make certain that his bedding remains his own for the length of his stay. Abandon the antiquated system of waking patients at 4 o'clock in the morning to steal the overbed blanket for storage in a closet, before indiscriminate redistribution at 6:30 at night when the patients are put to bed. This is such an obvious and classical way to accomplish cross-contamination.

In various hospitals, the top blanket is washed when the patient dies, or seasonally every six or eight months. These blankets should stay with the individual patients and should be washed when the patients are discharged. As they are laundered, they should be treated as described to render them bacteriostatic.

Air-borne contamination in the operating room can be lessened if care is taken to keep blood, pus, suture ends, and dirty sponges off the floor. If they inadvertently reach the floor, that spot should be disinfected immediately with an active germicide. A cheap and readily available product for this purpose is Purex dry bleach. This can be purchased from the local grocery store and mixed with ordinary tap water to make a slurry which is smeared on the contaminated area.

At the end of the day, the operating room floors should be thoroughly disinfected by a radically different technic. About 10 liters of a detergent-germicide mixture are made up, and one liter is spilled on the center of the floor, which usually accommodates the operating table and surgical team. The area is scrubbed thoroughly with a clean mop head to completely dissolve any blood or pus.

The remaining nine liters are spilled on the floor and spread with the mop to the periphery of the room, so that the entire floor is covered with a uniform layer of detergent-germicide. Then, beginning at the door, the puddle is taken up with a wet pick-up vacuum cleaner.

If this procedure is followed for nine or 10 days, the bacterial count will drop from about 500 per square centimeter to 0 to 1. This is the goal of daily sanitization of the floor.

A good way to demonstrate the source of the high bacterial count of the floor is to culture that floor after mopping it with the mop and pail from the janitor's closet. Such mopping paints the operating room floor with a pure culture of organisms that run into thousands per square centimeter. Too often, the janitor's closet, the filthy mop and pail are concentrated cultures of organisms.

From this, you deduce that you must get rid of the janitor's closet and, in its place, install good flushing rim-service sinks in every substerilizing room and use freshly laundered mop heads every day. Get rid of this central reservoir of bacteria. Improved floor care in

the operating room is essential and is indicated in ward housekeeping.

Wards should not be dry-dusted, but instead should be mopped routinely with a detergent germicide and thoroughly cleaned with a wet pick-up technic twice a week. Floor dressings with residual, germicidal effect can also be applied.

I won't belabor the point of dressing technics, but obviously these must be mastered to reduce skin infections in the staff.

Finally, be certain that septic instruments and textiles are disposed of through terminal sterilization within the operating room itself. This means that instruments and equipment should go directly from the operating field to the sterilizer. They are not routed to a sink for cleaning first, because in such cleaning the organisms are distributed to the hands of the person doing the cleaning, to his clothing, and eventually all over the room. From there, the cycle begins again.

These are, briefly, the elements of control in this problem. The problem needs definition so that the interest and attention of the staff can be elicited. Their co-operation is essential in prodding the hospital, as an institution, to eliminate large areas of organized negligence built into habitual and traditional practices. Remember that the dirty mop reaches the operating field more often than the average hemostat.

ILLUSTRATIONS

Figs. I and II: *Aerosol Sterilization of Air-borne Bacteria,* Williamson and Gotaas, **Industrial Medicine, 11:40-45, 1942.**

Figs. III and IV: *Atomizing of mouth and nose secretions into the air as revealed by high-speed photography,* **Aerobiology (Am. Association for the Advancement of Science),** Publication No. 17 pp. 106-128, 1942.

Fig. V: *Surgical Masks. An experimental Study,* Hirschfelt and Laube, **Surgery: 9:720-730.**

Figs. VI, VII and VIII: *Air Infection with Dust Liberated from Clothing,* Duguid and Wallace, **Lancet,** Nov. 27, 1948, pp. 845.

Figs. IX and X: *Control of Wound Infection in a Thoracic Surgical Unit,* Blowers and Mason, **Lancet,** Oct. 15, 1955, pp. 786-794.

Assisted by Dorothy W. Errera, R.N.

Q. Recently our hospital was inspected by a representative from the American Hospital Association. He stated that all ordinary dirt contained B. Subtilis and the dirt could be dried for a certain number of hours, placed in a pack, and sent to the laboratory to be cultured. Is this a good way of testing the sterilizing ability of an autoclave?

A. The American Hospital Association representative described a sound technic of testing sterility which is based on the bacteriologic studies of soil which contains both anaerobic and anaerobic spore-bearing organsims. The technic is described in full detail on page 86 of *Aseptic Treatment of Wounds.*

You can also purchase from Baltimore Biologic Laboratories preparations of heat-resistant, spore-forming organisms which are sterilized along with a load. These cultures, when placed in strategic positions in the sterilizer or a pack, will demonstrate that for that given instance, a lethal concentration of steam was or was not present in the sterilizer.

The thing to remember is that testing indicates sterility of the sample tested only. Safe, fool-proof sterilization practices are based on sound knowledge of the tenets of packaging and loading; proper sterilizer operation and maintenance; the use of mechanical controls for impounding a load and measuring the quality of steam present, and the rigid enforcement of these rules by conscientious, qualified personnel.

Q. I recently read the article titled "Severe Dermatitis Is Eliminated by Complete Removal of Residual Drugs from Syringes." Our hospital is not equipped with a dry heat sterilizer, so we intend to use our steam sterilizer. On a trial run with this method, I have noticed that the chamber reveals a temperature of approximately 170 degrees F. under 20 pounds of pressure in the jacket. This amount of heat will not change the color of our sterilizer.

The questions are:

(1) How would I maintain a temperature of 250 degrees F. within the chamber?

(2) Is a steady temperature of 170 degrees F. over a period of six hours adequate? If adequate, what sterilometer could I use?

(3) Would the method of wrapping our syringes hinder the use of this dry heat sterilization procedure?

A. When a dressing sterilizer is used as a dry heat sterilizer by maintaining steam under pressure in the jacket, the thermometer in the air chamber and condensate discharge line does not register chamber temperature because the discharge line is full of air. Any temperature recorded is that conducted to the thermometer by the metal band of the discharge line.

A thermometer can be installed in the jacket discharge line to indicate the presence of steam for control purposes.

Dry heat at 250 degrees F. will not change sterility indicators which depend upon the presence of moisture such as the sterilometer you describe.

Syringes sterilized by dry heat are preferably unwrapped so that heating is uniform.

Q. What is your opinion of single-shell autoclaves? Could they be used for sterilization or disinfection?

A. Single-shell autoclaves differ from jacketed dressing sterilizers only in that the chamber of the latter is surrounded by a heated jacket which in turn heats the chamber walls and minimizes condensation. The single-shell autoclave should be equipped with a thermometer in the air and condensate discharge line for measuring the quality of the steam filling the chamber.

Q. Does equipment used for nitrogen mustard therapy need any special treatment?

A. Nitrogen mustards have severe vesicant properties, are very irritating to mucous membranes, and are particularly harmful to the eyes. Hence, all equipment contaminated with the drugs must be handled carefully to prevent skin irritations or burns. The person administering the drug should wear rubber gloves while mixing the solution and rinse the equipment in warm water while still wearing gloves.

After being rinsed, the contaminated syringe and needle are immersed in a solution of 1:1000 sodium hypochlorite for at least an hour before being handled. The infusion set used should be rinsed well with warm water before it is discarded.

Q. It has been the custom in this hospital to place glass sterilizer indicators only in the large surgery linen packs. These indicators cost four cents each. With the intention of placing indicators in all surgery packages to be sterilized, paper indicators have been considered, since their cost is 50 percent less.

(1) Do sterilizer indicators have to meet standards established by an independent group such as a committee of the American Medical Association or the Federal government?

(2) Which are more reliable, glass or paper indicators?

A. I think that the use of telltale controls in sterilization is a needless expense which can be avoided by intelligent operation of the sterilizer and good maintenance of that sterilizer. A predetermined sterilizing time based on the largest pack or the largest flask of solution to be sterilized should be adhered to. The sterilizer should be loaded to provide for free interchange of air and steam and a horizontal path for the escape of air and steam from containers, sponge jars, etc. The sterilizer must be fitted with a thermometer in the air and condensate discharge line. Exposure must be timed from the moment the temperature reaches 250 degrees F. and continued for 30 minutes.

Detailed discussion of this problem can be found in Chapter 8 of *Aseptic Treatment of Wounds.*

Q. You say it is unnecessary to reautoclave sterile supplies. Why go through the trouble of dating them, then?

A. Personnel using sterile supplies need some means of distinguishing the sterile from the unsterile. It is not enough to just use separate storage or separate shelves —arbitrarily deciding that one is for sterile supplies and another for unsterile supplies. There is too much chance of error in sorting supplies in this manner— changes of personnel, vagaries of human behavior, etc. If supplies are routinely marked as they come from the sterilizer and personnel conditioned to checking for that mark before using sterile supplies, the patient is assured a measure of safety. It makes no difference if that mark be a date, an initial, or the new pressure-sensitive tape which changes color when exposed to heat.

Q. What is the proper technic for sterilizing radon seeds before implantation?

A. That is difficult to answer because the technic of applying radon seeds varies so much. Immersion in any of the formaldehyde-alcohol germicides for three hours is satisfactory. In most instances, the seeds are implanted into the tumor so that a track is left to the outside and spore formers are not too much of a problem. Remember too that the rays are ionizing and destroy bacteria.

Q. We would appreciate answers to the following questions: (1) What solution do you suggest for effective sterilization of sharp-edged instruments? (2) Would you discuss the effectiveness of quaternary ammonium compounds in the sterilization of sharp-edged instruments and brushes? (3) What do you consider the best and most effective method of sterilizing brushes used in scrubbing?

A. Cutting-edge instruments, and those so delicate that heat destroys them, are commonly disinfected by chemical germicides. In recent years, investigation has shown that the virus of epidemic homologous serum jaundice is not destroyed by any known chemical. Hence, sterilization by heat is essential for patient safety. Delicate cutting edges are best sterilized in dry heat at 320° F. (160° C.) for one

hour. Instruments must be clean and free from oil or grease when placed in the sterilizer. Lacking such equipment, an ordinary jacketed steam sterilizer can be used for this purpose, by turning steam into the jacket only. The instruments are left exposed to dry heat at 250° F. (120° C.) for four hours.

Surgical scrub brushes are rinsed after use and sterilized in saturated steam at 250° F. (121° C.) for 30 minutes, along with other supplies.

Q. What does heating do to solutions of quaternary ammonium compounds? How long does this action remain? Is it permissible to reheat the same solution?

A. Heating the quaternary ammonium compounds increases their efficiency. They should not be boiled. Reheating has no deleterious effect.

Q. We feel that it is poor technic to place suture needles on cloth such as muslin, ace bandage, or crinoline, and to chemically disinfect them in this manner. We have found, through a questionnaire, that this is quite a widespread practice, but cannot discover whether or not it is possible to chemically disinfect cloth. We would appreciate your opinion on this matter.

A. The use of chemical disinfection should be abandoned wherever possible because of the danger of transmission of homologous serum jaundice, the virus of which is destroyed only by exposure to high temperatures. The disinfection of suture needles by immersion in germicide, is an obsolete, unsafe technic. These are best sterilized in a metal spring clamp by exposure to dry heat at 250° F. for four hours, or 320° F. for one hour. Any jacketed sterilizer can be used for dry heat sterilization by turning steam into the jacket only.

Textiles are difficult to disinfect by chemical means because a large percentage of the active agent is removed from solution by the material being disinfected. Hence, if a proper concentration is not assiduously maintained, the effect of the germicide is that of plain water.

Q. In our emergency room we use Zephiran Chloride 1:1000 solution for sterilization of instruments. We have heard the statement that Zephiran is no longer adequate for sterilization purposes. If this is true, what would you recommend?

A. The quaternary ammonium compounds (Zephiran, Ceepryn, etc.) are not tuberculocidal but are effective germicides for the disinfection of various plastics, ampoules, etc.—articles which cannot be sterilized by heat and which have not been contaminated with blood. For effective disinfection, everything must be clean, free of grease and oil and completely submerged. No germicide is adequate for sterilization of instruments.

Q. In the past, I have been sterilizing syringes and needles in a container in dry heat (using the autoclave at night). I have recently been advised that they are to be sterilized in saturated steam for 30 minutes.

I would like to know if putting 2 cc. of water in the container and leaving the lid off while sterilizing is adequate or if more water should be used.

Because of the infrequency of use of syringes on

many divisions of a neuropsychiatric hospital, I have been doing the syringes up in cloth covers. A needle is also done up with the syringe. This is placed in a constricted tube with a commercial rubber stopper on it. I have sterilized these in dry heat at night, using our autoclave as you suggested. I would like to know, if this same package is sterilized in steam under pressure, would the rubber stopper prevent the steam from reaching the needle?

In sterilizing spinal needles in dry heat, I have been leaving the stylets in the spinal needles. Should they be removed when this type of sterilization is done? If they are sterilized in steam under pressure, what method is used?

A. When sterilizing syringes with the plunger assembled into the barrel, it is important to moisten the plunger immediately before slipping it into the barrel to be certain that moist heat contacts bacteria between the glass parts.

A small amount of moisture in the bottom of the container as you describe will insure expelling all the air from the container during steam sterilization.

When sterilizing needles in a glass constriction tube, it is important to dip the needle into distilled water before inserting it in the tube. The tube should be closed with a pervious stopper, such as a plug of cotton. A rubber stopper will prevent the escape of air and the needle will not be sterilized, other than by dry heat.

When syringes or needles are sterilized by dry heat, the parts need not be separated because they become uniformly hot and adequate time is allowed for that degree of dry heat to destroy the bacteria.

The reason that moisture must be present in the lumen of the cannula and between the parts of an assembled syringe is that the period of exposure to 250° of steam is so short that moisture must be present for the steam to be bactericidal. Under these circumstances, you can see that it is perfectly proper to sterilize a needle with the stylet in place in dry heat.

The same can be accomplished in the steam sterilizer if the cannula of the needle is flushed with distilled water immediately prior to placing it in the sterilizer. The water will creep into the capillary space between the stylet and the wall of the cannula and provide the necessary moisture to destroy bacteria.

Indiscriminate shuffling of needles and stylets is unsafe because the electrolytic action set up between the possibly dissimilar metals can cause corrosion, weakening, and tissue irritation.

Q. In a recent article in HOSPITAL TOPICS (July, 1955) mercury cyanide solution was listed in the equipment for a female catheterization tray. It is apparently intended for disinfection of the nurse's hands. Is this a good germicide for this purpose?

A. Mercury oxycyanide is an obsolete disinfectant with little bacteriostatic worth. It is harsh on the skin and causes discoloration of the nails. Care of the skin of the

nurse's hands is a serious problem, no matter where in the hospital the nurse is working. An ideal technic is one in which the nurse scrubs well with a brush and a soap or detergent containing hexachlorophene or actamer on arrival for duty. Thereafter, during the day she washes her hands *after* every patient contact, using the same detergent-germicide mixture.

For a treatment such as catheterization, a thorough hand wash as described is safer and more realistic than the previously popular, time-consuming brush scrub.

This technic as applied to the premature nursery is described in an article in *Surgery, Gynecology and Obstetrics* for November, 1953.

Q. When giving hypodermics, which is more effective for skin cleansing: 70 percent alcohol or aqueous Zephiran solution 1:1000?

A. Seventy percent ethyl alcohol is a good germicide for disinfecting the skin for hypodermic injection. If Zephiran is used enough time and friction must be used so that the skin has a rosy glow.

Q. What is a good soap for a preoperative scrub?

A. Any soap or detergent with at least 2% G-11 content is good, but should not be considered a single-shot germicide. Tincture of green soap is a poor detergent. It will not lather, it has no germicidal action, it is expensive, and it should not be used in the hospital.

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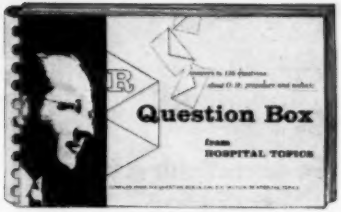

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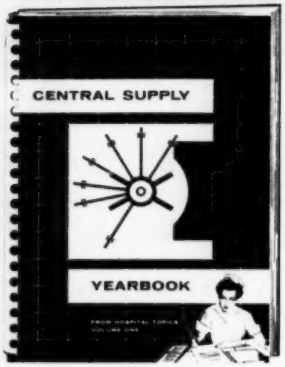

HOSPITAL TOPICS was the first hospital publication to recognize the importance of the central supply department by establishing a special section for its personnel. From those articles the editors have carefully selected the ones which appear in this yearbook. They deal with every major CSR problem, whether it's methods of sterilization, inservice training, or work simplification. Among the authors: Margaret K. Schafer, R.N., Frederick Markus and Jean Christie, R.N., Velma Chandler, Ph.D., Betsey Carroll, R.N.

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Q. Would you please help us with a problem on sterilization? How would you sterilize cocaine solution which is used in small amounts for eye surgery. This solution is not injected but used as drops in the eye for local anesthesia.

A. Sterile cocaine solutions can be prepared easily in two forms.

(a) Colyrium

Cocaine hydrochloride	5 gm.
Boric acid	22 gm.
Distilled water to	1000 ml.

The pH of this solution is 5.0 It is isotonic with tears.

(b) Topical anesthesia

Cocaine hydrochloride	100 gm.
Sodium chloride	7.5 gm.
Dilute hydrochloric acid ION	0.1 ml.
Distilled water to	1000 ml.

After solution is complete, the solution is filtered through a sintered glass filter and aliquots are bottled in screw cap bottles with Durez caps.

The bottles are sterilized by exposure to saturated steam for 30 minutes after the temperature in the exhaust line has reached 121° C. The steam supply to the sterilizer is then shut off. The bottles are removed when the chamber pressure reaches zero as the result of cooling rather than venting of the sterilizer.

The bottles should be stored in the dark.

Acute cocaine poisoning is not uncommon. Users should be familiar with prophylaxis of untoward responses to cocaine and specific therapy for acute poisoning. Because of its addicting potency, cocaine is included among the drugs whose use is controlled by the Federal Narcotic Regulations.

Q. One of our g.u. men says that in some places tap water is used for transurethral resections and sterilization is not important. This hospital does have its own well of artesian water, which, I have been told, does not contain lime as other water does. How do you feel about this?

A. Tap water should never be used for distending the bladder during transurethral resection, because the likelihood of infusing some of the material into the veins of the prostatic bed is too great. When this happens, intravascular hemolysis of red cells occurs. This can cause acute renal tubular degeneration. It is good practice to use an isotonic solution, such as 1.25% glycine, as described in *Journal of Urology* 59:1212; 1948.

In addition, tap water contains electrolytes which interfere with the action of cutting currents of the endothermy.

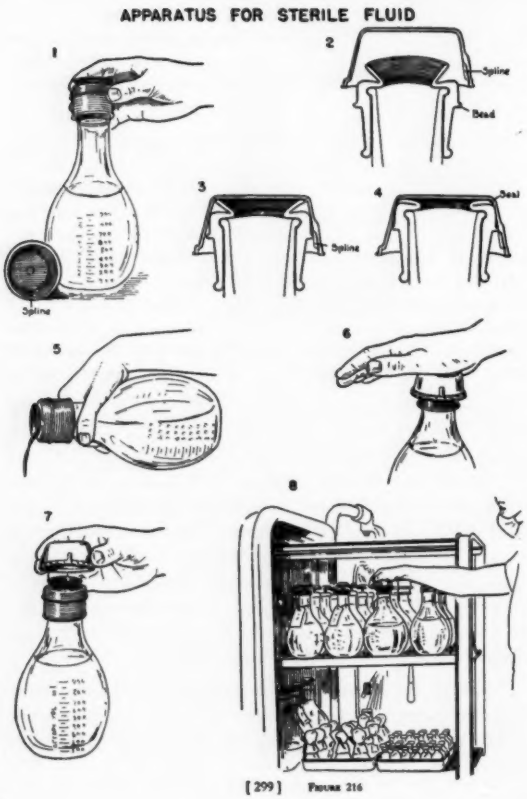
Q. We would like to have your opinion on whether or not it is necessary to check the sterility of the water in the sterilizer tanks. What is the procedure you use in doing this?

A. There is little justification for the continued use of water sterilizers in modern hospitals. They are expensive, plagued with possibilities of contamination and contribute little to patient care or aseptic technic that cannot be accomplished more advantageously by other technics.

Sterilized tap water is unsafe for use as an irrigating solution in surgery because it is not isotonic and is physiologically unsafe for the patient. The mode of transporting water from tank to field is in itself a major factor in contamination, inasmuch as the container is too often an ordinary wide-mouthed pitcher with an improvised cover. As irrigating fluid for patient care, it presents the hazard of burns to the patient because the temperature of the water as it leaves the tank may be too high for routine use and no means of measuring that temperature is readily available.

Modern hospitals are adopting the technic of bottling fresh distilled water, Cushing's solution, Ringer's Solution, etc. and sterilizing the solutions at 250° F. for 30 minutes. In proper containers and closures, a hermetic seal results which maintains the sterility of the fluid until the flask is opened. The seal itself serves as an indicator of the effectiveness of the sterilizing cycle and closures are available which provide safe, sterile pouring surfaces. At operation, the solutions can be kept at constant temperature in automatic heating cabinet (See illustration on page 140).

Sterility tests can be done as described in the U. S. Pharmacopeia but are of little practical value, as one of the requisites is seven days incubation of the sample tested.



Left: This illustration of sterile fluid apparatus is from *"Aseptic Treatment of Wounds,"* page 299. Question on page 139.

Q. Do you believe that during a septic case all members of the operating room team, including the circulating nurse, should wear gown and gloves?

A. I do not feel it is necessary for the circulating nurse to wear a surgical gown or gloves during a septic case unless she is in a position to be spattered with blood or pus from the field, or likely to handle contaminated instruments from the field.

Q. In tuberculosis surgery, do all members of the team have to remain in the room? What is the best method of caring for an operating room after a patient with pulmonary tuberculosis? Should you close a theatre after a contaminated case; if so, for how long?

A. The only added caution indicated following surgery on a patient with tuberculosis is special handling of the anesthesia and endoscopic equipment. Terminal disinfection of these bits of equipment is of paramount importance to avoid the spread of infection.

Few germicides destroy the mycobacterium tuberculosis. The effective few include:

ethyl alcohol 70%
isopropyl alcohol 70%
cresol solution, saponated USP XIII
orthophenyl phenol

p. tert. amylphenol 2% (Amphyl, Lehn & Fink)
iodophors (Wescodyne—West Disinfecting Co.)

Following bronchoscopy, esophagoscopy or laryngoscopy, all instruments which cannot be exposed to heat, are immersed in a tray containing a solution of any of the agents listed. After 15 minutes immersion, the lumen are scoured with long handled brushes to remove all mucus, blood and pus. They are then rinsed with tap water, dried by exposure to dry heat and stored.

Quarantining an operating room after a septic case does not make that room safe for subsequent use; indeed, the potential of transmission of dangerous organisms is increased. The operating room is safer immediately after a septic case because blood and pus containing dangerous organisms are still moist and remain on the floor and furniture.

After several hours these vehicles dry and the bacteria are scuffed into the air with dust. A safer technic is to wash potentially contaminated areas of the furniture with a solution of Wescodyne or Amphyl; disinfect the floor with a similar solution and dispose of instruments and textiles as outlined in Chapter 15 of *Aseptic Treatment of Wounds*. The room is then safe for immediate use.

In all surgery, whether or not a diagnosis of communicable disease or sepsis has been made, the members of the operating team should remove their gowns and gloves before handling clean equipment, furniture or supplies. Their gowns and gloves should be disposed of with the remainder of the instruments and supplies. Following a septic case, members of the surgical team, circulating nurses, visitors, etc., should disinfect the soles of their shoes by wiping on a plastic mat saturated with any of the solutions mentioned.

Q. I have tried to get accurate information about germicides for use with contaminated cases but have been unable to do so. I have taken one of Dr. Walter's courses and feel that anything that will withstand autoclaving should be autoclaved.

A. The stress on terminal disinfection of instruments and supplies following surgery is necessarily shifted from the septic case to *all* surgery by the increasing evidence that the virus of homologous serum jaundice is destroyed only by heat and is resistant to all known chemical agents. The virus is transmitted in blood and body fluids and may be considered present in every individual. Hence the problems of terminal disinfection become applicable to all surgery.

All equipment and supplies contaminated with blood or body fluid must be heat sterilized before being handled. Chemical disinfection is limited to use with new, unused, non-heat stable equipment. This serves to emphasize the importance of more careful planning and organization of supplies to avoid unnecessary waste of equipment which cannot be terminally disinfected by heat. The burden of responsibility lies with the scrub nurse who must evaluate carefully which plastic prosthesis, which catheter, or which tube of

expensive suture material is to reach the operative field.

Q. In our hospital we do sponge counts by collecting discarded sponges on a towel placed on the floor. When a given number have accumulated, we cover the layer with another towel, etc.

My question is: I disagree on the use of the floor as a working area, because basically we were taught that the floor is the main source of contamination at any time. Therefore, nurses are never allowed to put the soiled bed linen on the floor in any circumstance. If students and graduates see this done in the operating theatre, it refutes the basic principles of nursing care that are taught in the preliminary period.

Please tell me what you think of the use of sponge racks, trays, or buckets. Generally speaking, there is no problem as to the count or the individual receptacles used during a case—but where do you put the sponges while you are counting them?

A. Sponge racks are unsightly, unsanitary, unclean devices which invite air-borne contamination. I agree with your contention that the floor of an operating room must be protected against contamination. An easy way to accomplish the sponge count is to count them directly from the kick pails into waterproof paper bags which are closed when a given number are accumulated. These bags can kept until the end of the procedure, should a recount be necessary.

Q.—We have been asked to disinfect linen from septic cases in the operating room. What is your feeling about this?

A. Attempts to disinfect operating room linen before laundering are unsafe and ineffectual. In the sorting and loading processes, enough bacteria-laden dust and lint would be freed to add considerably to the problem of air-borne contamination in the operating room. Proper laundering practice in either the hospital laundry or a commercial laundry exposes the linen to water hot enough to destroy any pathogens present.

A. O. R. N. Group Formed in Boise

Operating room nurses in the Boise (Ida.) area have organized a new A.O.R.N. group. Members are shown above at a recent gathering.

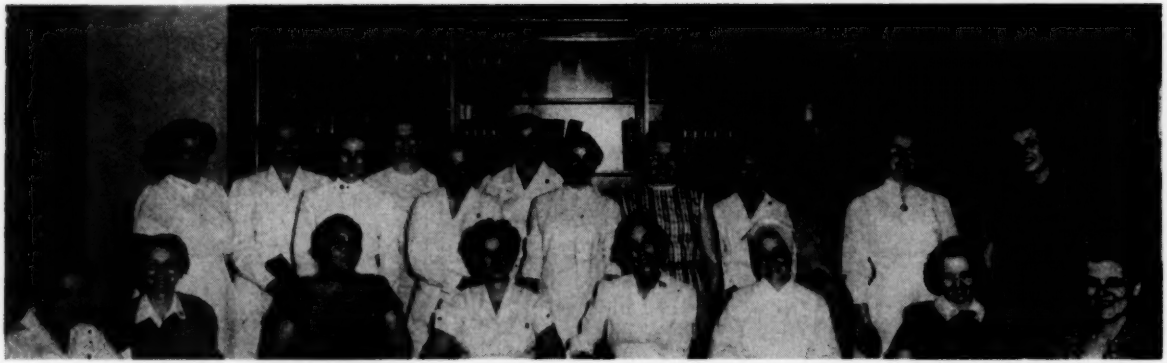
New A.O.R.N. Group Formed in California

• Pictured at a dinner meeting at the El Tejon Hotel, Bakersfield, Calif., are members of the newly-organized A.O.R.N. group in the Bakersfield area.

Standing (l. to r.): Mary J. Sands, O.R.S., Greater Bakersfield Memorial Hospital, chairman; Eva Woods, Kern General Hospital, Bakersfield, treasurer; Bessie Downs, Westside District Hospital, Taft, Calif.; Elise Broadhead, assistant O.R.S., Mercy Hospital, Bakersfield; Alma Kauffman. O.R.S., Westside District Hospital, and Ann Jacobs, Mercy Hospital.

Seated (l. to r.): Maggie Longest, Greater Bakersfield Memorial Hospital; Marvel Oldham, O.R.S., Monterey County Hospital, Salinas, Calif.; Cora Buckingham, O.R.S., Kern General Hospital; Marie De Lucia, O.R.S., Bakersfield Hospital; Florence Robey, assistant O.R.S., San Joaquin Hospital, Bakersfield. Not shown is Imogene Castle, O.R.S., San Joaquin Hospital, secretary.

Allen Russell, M.D., chief of anesthesiology, Fresno Community Hospital, spoke at the meeting.



Chattanooga Area A.O.R.N. Group

● Members of the recently-organized A.O.R.N. group in the Chattanooga, Tenn. area, are pictured above attending one of their regular monthly meetings. The group meets on the first Wednesday of every month.

Seated in the front row are (l. to r.): Goldie Dappert, Memorial Hospital; Carol Crandall, Memorial Hospital; Frances Short, Tri-County Hospital, vice president; Ruth Rackley, Tennessee T.B. Hospital, secretary; Sue Huneke, Memorial Hospital, President; Sister James Agnes, Memorial Hospital; Irene Stuman, Memorial Hospital; Stella Langston, Tri-County Hospital.

Standing in the second row are (l. to r.): Pauline Smith, Tennessee T.B. Hospital; Lois Myers, Tennessee T.B. Hospital; Roselle Warmack, Memorial Hospital; Martha Sandidge, Tri-County Hospital; Inez Richardson, Memorial Hospital; Virginia Stone, Tennessee T.B. Hospital; Jerri Hilliard, Tri-County Hospital; Norma Ervin, Children's Hospital; Lela Wilson, Memorial Hospital; Martha Messinger, Memorial Hospital; June Hill, Memorial Hospital; Ruth Cornell, Children's Hospital.

South Dakota Nurses Form A.O.R.N. Group

● A meeting of the newly organized South Dakota Association of Operating Nurses was held recently in Rapid City, S.D.

Officers of the group, elected at the meeting, are: Sr. Mary Aloysilla, president, St. John Hospital, Huron, S.D.; Sr. M. Mona, vice-president, Sacred Heart Hospital, Yankton, S.D.; Mrs. Esther Urbina, secretary-treasurer, Sioux Valley Hospital, Sioux Falls, S.D.; St. Mary Norberta, board member, Sacred Heart Hospital, Yankton, S.D. and Sr. M. Macaria, board member, St. Mary's Hospital. Pierre, S.D.

Montreal Forms AORN Unit

Officers elected at the City of Montreal A.O.R.N. group pictured at the right are (l. to r.): **Back row:** Ena O'Hare, St. Mary's Hospital; Vivian Crouse, Montreal General; Miss Lefebvre, St. Luc's Hospital; **front row:** Claire Brault, Notre Dame Hospital; Mary Warnock, Royal Victoria Hospital and Sister Michaud, Hotel Dieu Hospital.

The initial meeting of the group was held November 7, 1955, Hotel Dieu Hospital, Montreal, Que., Canada.

East Texas AORN Group Organized

• Pictured are members of the newly-organized East Texas AORN group, taken at their first meeting March 2nd at the Carlton Hotel, Tyler, Texas. Included in the picture are, seated (l. to r.): Kitty Young, Medical Center Hospital, Tyler, secretary-treasurer; Sister Dommicille, Mother Frances Hospital, Tyler, chairman; June Murphy, Mother Frances Hospital, Tyler, program chairman; Louise Anderson, Laird Memorial Hospital, Kilgore, vice-chairman; Naomi Wall, Panola General Hospital, Carthage. Standing (l. to r.): Margaret Sarkin, Panola General Hospital, Carthage; Billie Sims, Medical Center Hospital, Tyler; Sybil Watson, Mother Frances Hospital, Tyler; Sister M. Rozella, Mother Frances Hospital, Tyler; Jeanette Herring, Medical Center Hospital, Tyler; Neva Reagan, Laird Memorial Hospital, Kilgore; Cleaone Morris, Mother Frances Hospital, Tyler; Anita Herndon, Laird Memorial Hospital, Kilgore; Pauline Branch, Medical Center Hospital, Tyler; Mary Manson, Mother Frances Hospital, Tyler; Midge Drennan, Mother Frances Hospital, Tyler.

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